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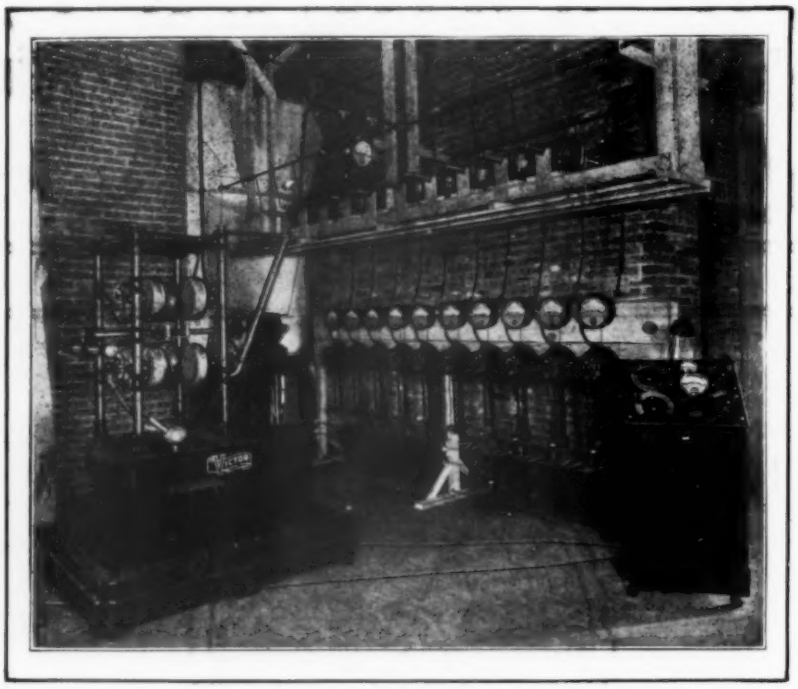

PROOF BY PERFORMANCE

The "Snook-Special" Deep Therapy Diagnostic Machine Proves Up Under Supreme Test

THE design of the "Snook-Special" Deep Therapy Diagnostic Machine was to provide for not only the present 200,000-volt Coolidge tube of 8 milliamperes capacity, but also in view of future Coolidge tube developments calling for higher milliamperes at this voltage.

It was desired that when offering the "Snook-Special" to the Roentgenologist a definite statement regarding its capacity could be made, substantiated by records of actual performance.

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This set-up has been running almost daily for some months past in our factory experimental department, and has furnished conclusive proof of its operating ability to many visiting Roentgenologists.

This demonstration is for the purpose of proving machine capacity and performance under conditions more difficult and exacting than any X-ray machine has ever been called on to meet. This is not intended as a demonstration of the feasibility of running tubes in multiple.

A bulletin containing complete description of the "Snook-Special" will be sent on request

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The JOURNAL OF RADIOLOGY
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VOL. IV OCTOBER, 1923 No. 10

Further Studies in Radiation Dosage*

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IN THE introduction to a monograph by the late Theodore Christen on the measurement and dosage of roentgen rays, published in 1913, it is stated in the opening paragraph that the great need in radiotherapy is the means of accurate dosage. Though the theories which Dr. Christen advanced in his book have been nearly forgotten, so rapid is the progress in our art, the words of the opening sentence are still as true as they were some ten years ago.

For some radiographers are still treating internal cancer with 10 or 15 minute exposures with a filter of 3 mm. aluminum and an 8-inch gap, but without the slightest idea of the erythema dose of their machine or any comprehension of the quantity or the effect of the radiation which is penetrating the deeper tissues. If they accomplish anything they stimulate the tumor rather than inhibit its growth.

But, on the other hand, there are fortunately many capable men who are studying by the most refined scientific methods the problem of applying to the tumor tissue a dose which will inhibit the growth rate of the neoplasm, even if it does not necessarily effect a permanent cure.

As a contribution to the subject which may interest the latter group, I want to present some of the recent studies which have been carried on in the Crocker Institute of Cancer Research, using animal tumors as an indicator.

These experiments were made in all cases with a commercial machine running at 170,000 volts. This voltage was very carefully determined by a physicist using a 25 cm. sphere spark gap and the standard potential tables for an instrument of these dimensions. The results were cross checked with a static volt meter which had been calibrated by the use of a 20 megohm resistance. The wave form of the machine is shown in Figure 1. It is fairly flat topped and below it is the current curve showing that the voltage and the current are in phase. The rectifying switch had been carefully set by determining with an ionization chamber the maximum output of x-rays, the only variable in the test being the position of the switch on its axle.

Repeated determinations of human erythema doses with the apparatus thus adjusted have shown that, on the average, 45 minutes with a 40 cm. skin-focus distance, 5 ma. through the tube, ½ mm. of zinc plus 1 mm. aluminum filter, will give a dose which is just short of an erythema. Forty-eight minutes is a good erythema on sensitive skins, and 50 minutes gives a fairly sharp reaction in ten days on insensitive skins.

The death point of the tumor which we have used as a standard (Crocker Fund Tumor No. 180) was found to be 250 minutes under these conditions, that is five erythema doses. The conditions of the experiment were such that all scatter was eliminated, the tumor being supported upon thin gauze at some distance from any substance which might give secondary rays.

Assuming, therefore, that the tumor is killed without scattering with 5 erythema doses, it is interesting to observe what happens when some substance whose absorption capacity corresponds approximately to that of human tissue is used between the tumor and the x-ray tube (Fig. 2).

Under these circumstances employing a block of paraffin wax 10 cm. thick at a distance of 10 cm. above the tumor with a 10 by 10 cm. field, the dose required to kill all the tumor cells was, instead of 250 minutes, 675 minutes. This shows that such a thickness of paraffin absorbs 63 per cent, in other words, only 37 per cent of the x-ray reaches the tumor placed 40 cm. from the anticathode. This may be called a pure absorption experiment. Such conditions do not apply in human therapy, as the tumor is always in contact on one or both sides with substances of low atomic weight which gives a large amount of scattered radiation. A superficial tumor receives a scattered dose only from the tissue under it. To determine the dose under these circumstances the tumor tissue was placed in a tube of celluloid on a layer of water or wax at a distance of 40 cm. from the anticathode and exposed. Instead of being five erythema doses the quantity necessary to kill all the cells of the tumor fell to about four erythema doses (Fig. 3).

As the tumor particles are not thicker than one mm. and are laid out in a plane, the inverse square relations and absorption factors in regard to tissue thickness can be disregarded. Thus, this particular tumor is some three and a half to four times as resistant as a human basal-cell carcinoma, which, as is well known, if it does not happen to contain pearls can usually be cured with a full erythema dose.

When the tumor tissue was placed between two blocks of paraffin, 10 cm. thick, the rays were allowed to strike the tumor material through a 10 by 10 cm. opening, the skin focal distance being 30 cm. and the distance to the tissue 40 cm., the dose was 360 minutes instead of 675, thus showing how important a factor the scatter is even through a comparatively small opening; nearly one-half of the effect being due to the scatter (Fig. 4). Inasmuch as the skin focal distance was only 30 cm. the erythema dose is much shorter, about 28 minutes, consequently the skin received slightly less than 20 erythema doses. This is a very unfavorable situation, practically because such dosage is impossible in man.

If on the other hand the lead opening was increased to 18 by 18 cm. all the conditions remaining the same, all the tumor cells were killed at 240 minutes exposure or 8.5 erythema doses to the skin (Fig. 5). This still is an unfavorable working condition, as it means approximately light portals. If, however, the skin-focus distance is changed, as it was in another series, to 40 cm. instead of 30, the tumor then being 50 cm. from the anticathode we get a

*—Read at the Annual Meeting of the Radiological Society of North America, Dec. 7, 1922.

death point of all the cells in 320 minutes, which is at that distance 6.4 erythema doses on the skin.

Nothing was varied in these last three experiments except the area of the portal and the skin-focal distance. Thus we get biological confirmation of what has been preached by Dessauer for many years, that from a purely physical point of view a much better depth effect is obtained by using a longer skin-focus distance. These experiments show that we are reaching a point even at 170,000 volts where we may theoretically assume we can kill all the cells in a tumor.

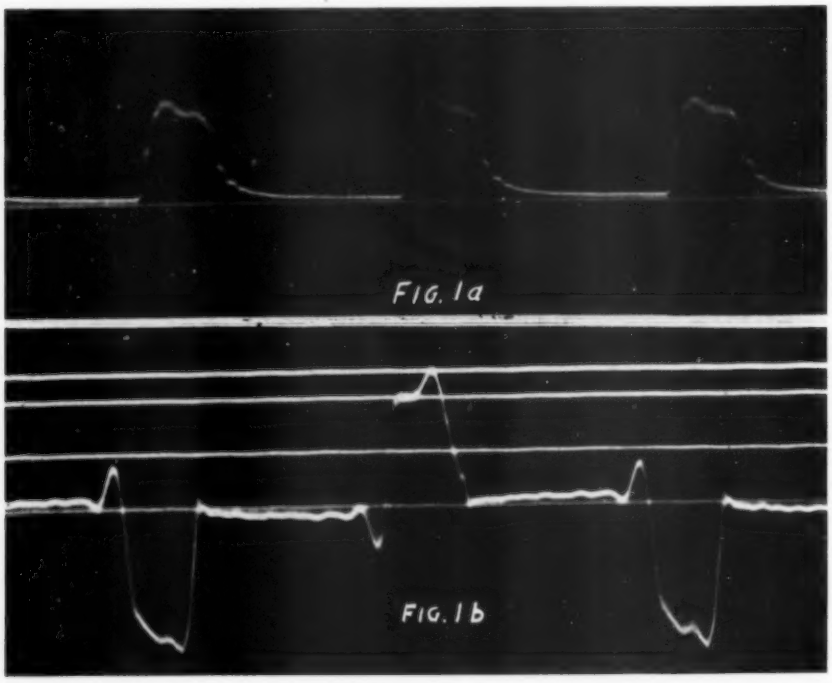
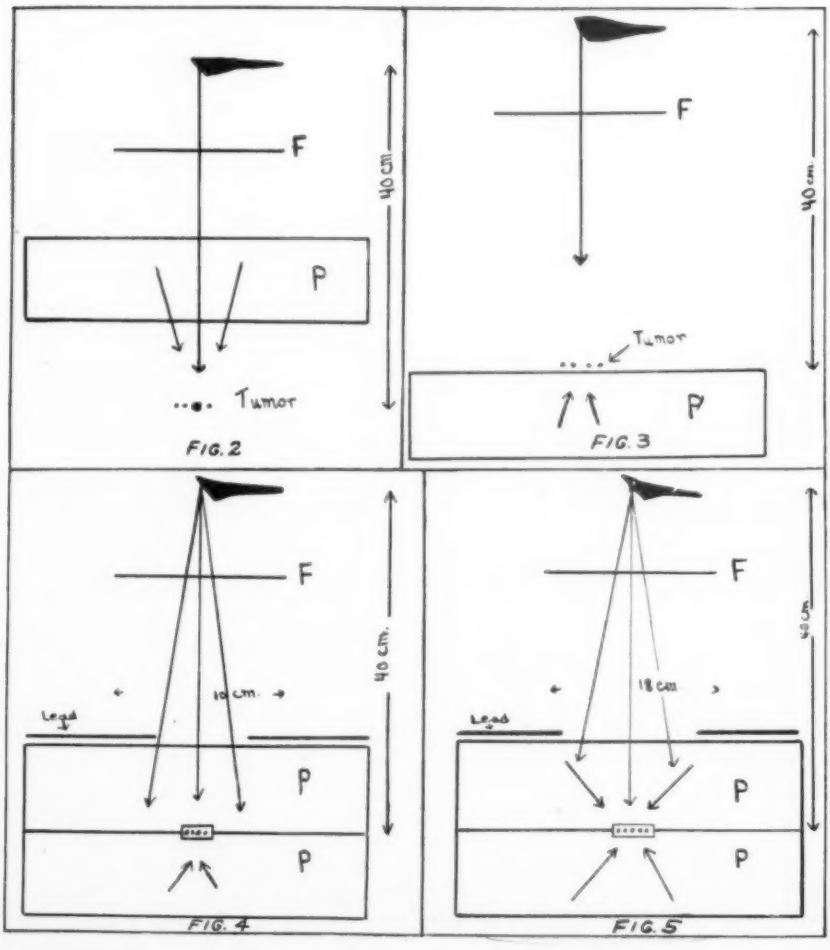


Fig. 1—**A**, oscillograph tracing of voltage. **B**, oscillograph tracing of current.



Whether this can be accomplished in practice must wait the clinical application of such facts as I have shown. Much remains to be done. We have not yet accurate data concerning normal tissue resistance, for example, whether human intestine or other hollow viscera will stand four erythema doses. Will the large portals which are necessary permit so great a destruction of normal tissue that the phenomena designated as radiation sickness necessarily interfere with our treatment? This, in my experience, has been a very serious matter with a number of patients who have practically refused treatment after a few exposures to an erythema dose, even though they realize that the radiation is controlling an abdominal tumor. We have not yet given more than four erythema doses at a sitting to a deep seated tumor, that is just two thirds the amount required to kill this mouse tumor No. 180. In several of these patients radiation sickness was not evident, but unfortunately also there was not the slightest change as far as could be made out in clinical examination of the tumor, which was in four instances inoperable carcinoma of the cervix.

We can reason, therefore, that the tumors in these patients were as resistant as a mouse tumor, for with even two erythema doses on a mouse tumor it is possible to kill a very large percentage of the cells composing the tumor and greatly to reduce its size.

I hope that on another occasion I will be able to report to you the continuation of these studies using, what is evidently necessary, higher voltages in order to get a better depth effect and also report some of the very interesting observations which we have been able to make on x-rays derived from a continuous current of high voltage.

It seems to me that the possibility of the cure of cancer from a point of view of apparatus alone depends upon our ability to obtain a tube which has a reasonable life at 250,000 volts with a capacity to carry a considerably larger quantity of current than at present.

If these conditions can be complied with, as the physicists have shown, a very much better depth dose can be obtained and we are possibly within striking distance of a cure. But I still believe, as I stated years ago, that a permanent cure of cancer means the direct destruction of every living cancer cell and that no help can be expected from the normal or irradiated tissues in which the cancer cells lie.

Bone Tumors, Benign Bone Cysts Due to Central Ostitis Fibrosa of the Unhealed Latent Type.

With Discussion of the Operative Treatment, Especially the Crushing of the Cyst Wall*

JOSEPH COLT BLOODGOOD, M. D.
Baltimore

IN THIS series of papers, written specially for this journal, I have endeavored as far as possible to deal with problems of diagnosis and treatment based upon the more recent observations and to write as briefly as possible, presenting the subject from the practical clinical side.

Etiology of Ostitis Fibrosa

Interesting as this is, at the present time, we do not know the cause of this lesion and we can outline no preventive treatment. Clinically, it is a benign lesion; pathologically, it is a form of chronic inflammation.

Biologically, its entire tendency is to spontaneous healing with restoration of the affected portion of the bone to normal. This is the biological history of practically all inflammatory processes: *First*, a reaction of the tissues to some known or unknown irritating factor; *second*, the production of a new tissue which may be called granulation tissue completely or partially replacing the normal tissue; *third*, the disappearance of this granulation tissue, its replacement by normal tissue with more or less residual scar tissue.

The duration of the process of new formation of granulation tissue and its reabsorption varies. The completeness of restitution to normal varies.

Clinical Picture First Type of Bone Cysts

The most striking fact in my personal study of now more than 100 bone cysts is that the majority can be placed in a single group in which the prominent clinical facts are: (1) The age of the patient is under eighteen, usually under fifteen; (2) a fracture of a long pipe bone after a slight trauma to the shaft; (3) an immediate x-ray demonstrates the disappearance of the normal picture of the marrow and cancellous bone, the presence of a thin shell of cortical bone which usually shows slight expansion, a fracture through some portion of this thin bone shell; (4) the degree of fracture varies from a line of destructed continuity in the thin bone shell up to extreme degrees of comminution. The former is common, the latter rare.

The situation of this bone cyst with the rarest exceptions is in the shaft and not in the epiphysis, and, although we must conclude that the bone lesion was present before the fracture there is no evidence in the x-ray of new periosteal bone formation on the cortical bone forming the bone shell.

The next most remarkable fact in this group is that if no operation is performed and the fracture is treated as any other fracture, healing with complete ossification and restitution to normal takes place almost as rapidly as after a fracture in a normal shaft.

This is a very important and practical knowledge and it leads to a definite line of treatment. In cases of this kind the treatment should be non-operative and identical with that for a fracture of a normal bone, except that in these patients x-ray pictures should be taken at more frequent intervals in order to demonstrate that ossification is proceeding normally not only in the line of fracture, but throughout the entire shadow of the cyst.

In a certain percentage of these cases the complete ossification of the area of the bone cyst shown in the x-ray is very much slower than in the normal bone. Especially is this true when the fracture is slight, incomplete or not comminuted. Therefore it is of great importance to be familiar with the usual healing of a bone cyst with the different degrees of fracture, so that one may conclude when operative interference is indicated, and to remember that when an operation is performed the most important thing to do is to produce some form of fracture or crushing of the bone shell.

Average Duration of Healing in The Common Type of Bone Cysts

I have for study here two groups: One in which no operation was performed, and the second, in which an operation was performed. The healing of the bone cyst in which there has been a fracture of very slight degree is usually not complete for two to four years. If accidental refracture takes place the rapidity of healing is increased. If the fracture is comminuted, complete ossification is as rapid as in the normal bone. The rapidity, therefore, of complete ossification in the ordinary bone cyst after fracture is largely influenced by the extent of the fracture. In a certain number of these cases operation has been performed. In the vast majority of cases the indication for operation was exploration for diagnosis. The healing in this group has been about identical with that in the first group, unless at the operation the extent of the fracture was increased, or the bone shell comminuted. In the first case operated on by me in 1903, in which the cyst occupied about one half of the upper portion of the humerus, the fracture was slight, transverse without displacement. The operation consisted in the removal of a small piece of the shell and letting out the fluid. There was no connective-tissue lining. At the end of one year the cyst was two-thirds smaller; at the end of seven years the humerus was restored to normal. In a second case, practically identical with the former, x-rays were taken at frequent intervals and complete ossification was not observed until the end of the third year. In a third case in which the cyst was much larger and situated in the tibia, I crushed the thin bone shell. Here complete ossification took place in three months.

There are numerous other observations which lead to the practical and definite conclusion that the best treatment for a bone cyst is a comminuted fracture. If ossification is not rapid after the first fracture much time will be saved by an operation.

Clinical Picture of the Second Type of Bone Cyst

Here there is no fracture. The presence of a cyst is found either accidentally because of an x-ray examination after an ordinary trauma, or because of pain and swelling. The size of the cyst varies. When these cases are studied with numerous x-ray pictures, we find that ossification is very slow. In the first case, observed by Colvin of St. Paul, in which the cyst was situated in the upper end of the ulna, it was seven years before complete ossification took place. This patient has now remained well more than fifteen years. I have an x-ray of a cyst in the upper third of the shaft of the femur in a boy aged nine years, which was revealed because the patient limped. We followed the cyst in the x-rays for three years: there was very little ossification. The patient, however, had no other symptoms but a slight limp. Operation was decided upon, but the boy fell, sustained a comminuted fracture in the region of the cyst and complete ossification took place in six weeks. This bone is prac-

*—Received for publication May 16th, 1923 (Reprint No. 122).

tically restored to normal now more than six years since the fracture.

Without going into the details of the other observations, the evidence favors the following conclusions:

When an x-ray shows a bone cyst without fracture, and subsequent x-ray examinations demonstrate slow or imperfect ossification, operation is indicated. The chief danger of not operating upon a bone cyst which is not ossifying is that it may reach great size and convert a simple operation into a difficult and sometimes dangerous one.

In addition, it is more difficult in the big bone cyst to restore the continuity of the bone to normal; there are very apt to be bending deformities very difficult to correct.

Clinical Picture of the Third Type of Bone Cysts

In this group the patient's age is over fifteen, and for this reason other types of central bone lesions cannot be excluded. If it is associated with a fracture of some extent, there seems to be no danger from the postponement of the operation which will be avoided if complete ossification is observed in the x-rays. But in the absence of fracture or if ossification is tardy or does not occur, operation is indicated. If a bone cyst is revealed nothing has been lost; if the tumor proves to be a benign giant-cell growth, or a chondroma, myxoma or sarcoma, no time has been lost in instituting the proper operative treatment.

The Crushing of the Bone Shell in the Operation for Benign Bone Cysts

This is best illustrated by the report in detail of the following case:

Case I. (Pathol. No. 32392, Figs. 1, 2 and 3): Benign bone cyst of upper end of femur involving the trochanteric area and neck. Patient, a white female aged 27; definite symptoms fifteen years, since the age of 12. Operation: removal of connective-tissue lining, filling the cavity with pieces of bone and crushing of the anterior shell.

Clinical Picture: This patient, Miss S., was referred to me by Dr. Abraham Shorr of Brooklyn, N. Y. The patient was aged 27, unmarried. She has been conscious of pain in the region of the left trochanter since she was 12 years of age, fifteen years ago. The pain is worse after walking, and after prolonged walking there is a limp. The pain and limp have gradually increased. Six months ago she began to use crutches and then, later, a Thomas's splint without crutches. The first x-ray, taken in June 1922, is practically identical with the one taken by Dr. Kahn in my office in April 1923. The patient does not remember how long she has been conscious of a swelling in the region of the left trochanter, or how long there has been apparent shortening of slight degree. There has been no evident restriction of motion in the hip-joint.

Etiological Factor: The patient distinctly remembers that she was knocked down by a bicycle before she felt pain and before limping began fifteen years ago.

Examination: All laboratory studies are negative. The x-ray and physical examination of the chest are negative; there are no evident foci of infection in tonsils, teeth or sinuses. The patient appears in perfect health, slightly overweight. Her recent occupation has been that of a teacher. The x-ray pictures of all the bones, except the upper end of the femur, show normal bone. The patient walks with a slight limp. When lying on her back there is an apparent shortening of about one centimeter and about an equal measured shortening. The outer lateral surface of the left thigh in the region of the great trochanter shows more of a bulging than the right. On palpation the left trochanter is larger than the right. There is no restricted motion in the hip-joint.

X-ray Study: The x-ray pictures (Figs. 1 and 2) were taken by Dr. Kahn, April 5, 1923.

When we compare the left upper end of the femur with the right, the pelvis and acetabular cavity seem identical. The width of the head in the acetabular cavity is identical; the shape and size of the heads of the femora are identical, but projecting from the neck of the left femur into the head is the definite shadow of a cyst with a thin definite bone shell, as if the neck had been broken and wedged into the head. (At operation we could trace the cyst into the head of the femur).

The outline of the left neck is entirely different from normal. Instead of two curved lines with the concavities towards the neck, the outline of the left neck is practically two straight lines between the head and the trochanter. The shape of the neck is that of a blunt wedge. The measurements of the normal neck at its base on the intertrochanteric line is 6 cm., on the affected side almost 8 cm. The bone shell of the cyst in the neck is intact, and we can follow this narrow shadow of the cortical bone of the neck into the head of the femur. The intertrochanteric line is partially obliterated. The greater trochanter is expanded, and the curve beneath the trochanter showing normal on the right side is changed from a convexity to a concavity on the left side and we can trace the cyst extending down into the upper shaft of the femur. The lesser trochanter is smaller on the affected

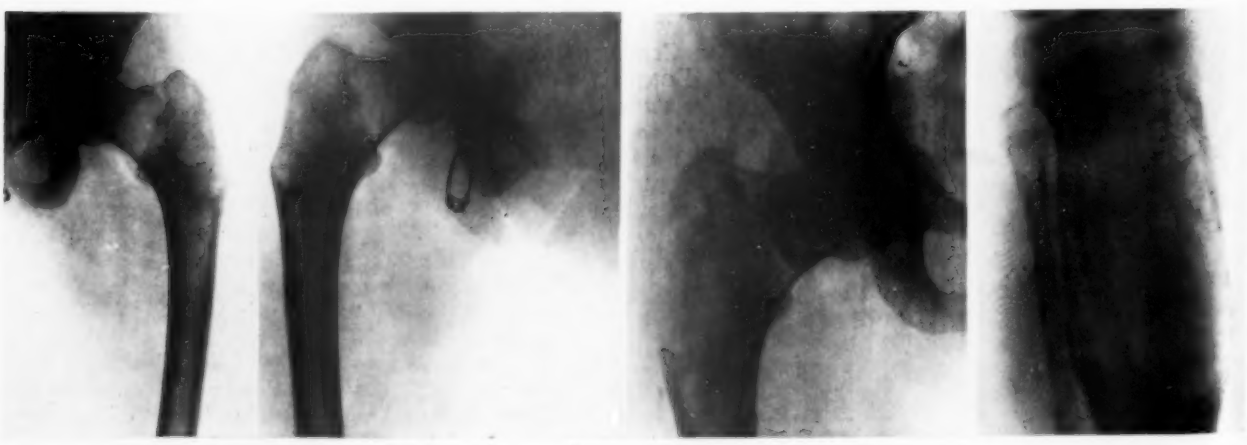


Fig. 1—Pathol. No. 32392. Case I. Bone cyst of upper end of femur, involving trochanter and neck. Compare the affected left with the upper end of the right femur.

Fig. 2—Pathol. No. 32392. Case I. Bone cyst of upper end of the femur, involving neck and trochanter. Age 27; symptoms 15 years.

Fig. 3—Pathol. No. 32392. Case I. Bone cyst of upper end of the femur, involving trochanter and neck. X-ray 12 days after crushing of the bone shell and filling it with fragments of bone.

Fig. 4—Pathol. No. 13831. Case II. X-ray of benign bone cyst of upper end of the tibia. No fracture. White boy aged 16; uniform swelling two and one-half years.

left side due to the expansion of the neck; there is a line of incomplete fracture in the upper end of the shaft, although there has been no history of fracture. The actual length of the neck of the femur on the left side between head and lesser trochanter is one centimeter longer. This lengthening of the bone is unusual in bone cysts, but it has been observed before. The shaft of the femur at a point just below the lesser trochanter bends inward producing an adduction deformity. The left trochanter is on the level with the upper rim of the left acetabular cavity, while the right is 2.5 cm. below it. This can be explained by the expansion of the trochanter.

It is very interesting to note that the x-ray absolutely outlines the bone cavity found at the operation.

Diagnosis: The age of onset at 12, was the chief evidence of a bone cyst. The long duration of the symptoms, fifteen years, excluded a sarcoma, but there is nothing in the x-ray picture to exclude a giant-cell tumor, myxoma, chondroma, multiple myeloma or metastatic hypernephroma. The giant-cell tumor rarely gives as long a history, but the chondroma and myxoma do.

Indications for Operation: Although the age of onset, twelve years, and the duration of definite symptoms, fifteen years, indicated a benign bone cyst, nevertheless the other types of central lesions, except sarcoma, had to be borne in mind. If the lesion was a bone cyst, operation was indicated, because after fifteen years it was still unossified and was already beginning to show bending deformity. Further delay would run the risk of further deformity and a larger bone cyst. Fortunately there was no interference with joint function, and the head of the bone and acetabular cavity were still intact.

X-ray or Radium Treatment: X-ray treatment had been given during the past summer without effect, and from my experience as already recorded in previous communications, operation promised more than any other type of treatment.

Plan of Operation: First, diagnosis. If the tumor should prove to be a bone cyst, no thermal or chemical cauterization would be necessary. The object of the operation would be to get ossification in the cystic area. If a giant-cell tumor, myxoma or chondroma were revealed, the object of the operation would be to get rid of the disease by thermal and chemical cauterization, or resection of the upper end of the femur with bone transplantation. The decision would rest upon the strength of the bone shell after eradicating the disease.

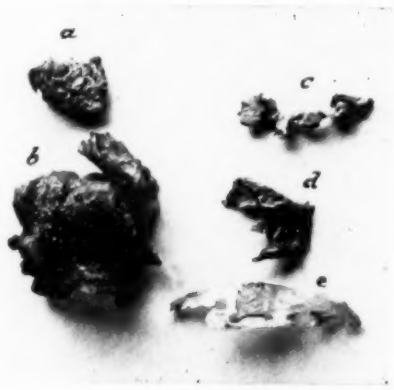


Fig. 5—Pathol. No. 13831. Case II. Photograph of the thin bone shell and connective-tissue lining from the benign bone cyst shown in Figure 4: **a** connective-tissue lining, surface covered with fine calcium deposits; **b**, surface of connective-tissue lining adjacent to the bone shell covered with fine sand-like spicules of bone; **c** and **d**, thinner portion of the connective-tissue lining; **e**, thin bone shell showing two perforations; the periosteum was intact over these perforations.

If the tumor should prove to be a bone cyst, I considered the question whether any attempt should be made to produce a fracture below the lesser trochanter in order to correct the adduction deformity. If you will glance at the x-ray picture you will observe that the thickness of the cortical bone of the bone shell is greatest on the inferior side of the neck and the medial side of the shaft. This was bearing the weight at that time. I felt that it would be safer to get ossification in the area of the bone cyst without fracturing this, the strongest, part. The function of the patient's limb was still good; the shortening was not enough to justify the risk of its correction. The object of the operation was to so strengthen the bone that there would be no further deformity.

Operation: St. Agnes Hospital, April 27, 1923. Anesthesia: novocain in the skin, gas, some ether. On exposing the upper end of the femur through an external lateral incision I was struck with the tenseness of the fascia lata and the relaxation of the fascia of the quadriceps femoris. We could feel the expansion of the trochanter and the obliteration of the curve of the shaft below, but we could get no yielding to pressure in the bone shell. On stripping back the periosteum, there was no excessive bleeding and the bone surface appeared normal. Usually in the bone cyst the bone shell is thin and has a dark gray appearance. The area of exposed bone on the external lateral surface of the femur from the top of the great trochanter down to the line of the apparent fracture, a distance of 8 cm.,

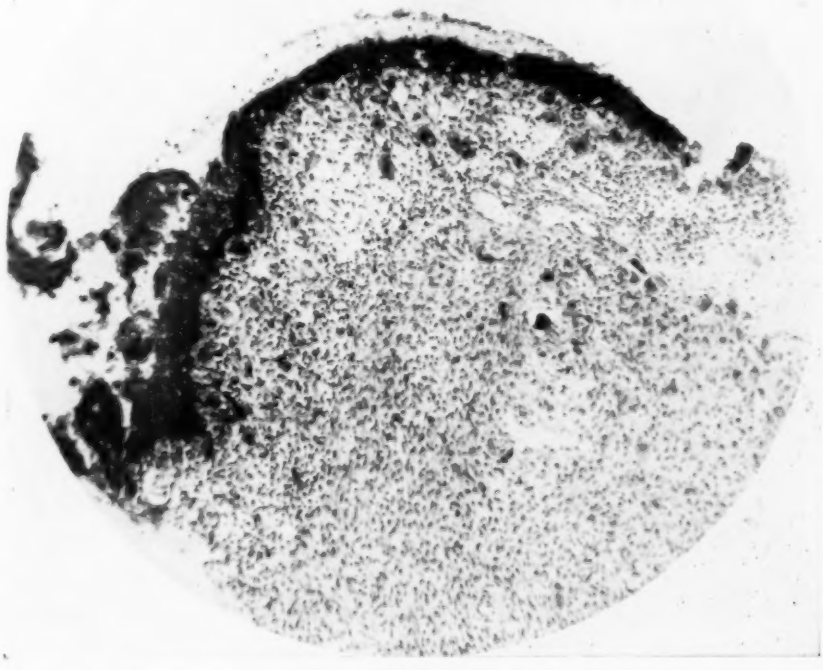


Fig. 6—Pathol. No. 13831. Case II. Photomicrograph of ostitis fibrosa in piece of connective-tissue lining shown in Figure 5-a. On the upper surface is shown a thin zone of calcium deposit; then a zone of vascular granulation tissue wtih giant cells; then a zone of cellular granulation tissue with less blood vessels and here and there a giant cell.

was chiselled off. This at once exposed a cavity in the great trochanter, in the neck, and in the upper outer portion of the shaft below the great trochanter, but the medial portion of the shaft below the lesser trochanter was filled with bone, and the marrow cavity was obliterated, as shown in the x-ray. The surface appearance of the bone shell was remarkable. Those parts having no connective-tissue lining were smooth and dead white; other parts contained a connective-tissue lining varying from 3 to 8 mm. in thickness. Here and there in the connective-tissue lining were areas of bone formation. The cyst was filled with a clear viscid fluid. We had the gross picture of a benign bone cyst based upon the clear fluid and the leathery connective-tissue lining. There was every evidence that that portion of the bone cyst in the upper third of the femur on the medial side below the lesser trochanter had ossified

After removing the connective-tissue lining I took most of the piece of bone first removed and placed it in the cavity of the neck. I then chiselled particles of bone off the shaft until the cavity of the neck was partially filled. Then with the chisel I comminuted the bone shell of the great trochanter and of the superior and lateral surfaces of the neck, leaving intact the shell of the inferior portion of the neck. With a chisel and a piece of gauze I hammered together this broken bone until it formed a compact mass filling the neck and involved portion of the shaft. I then sutured the relaxed fascia of the quadriceps in such a way that muscle was inverted and packed against the mass of bone particles. This was done to insure better circulation. The wound was closed in layers with catgut.

Figure 3 (Pathol. No. 32392) is an x-ray of the result 12 days after operation.

Remarks on Case 1 (Pathol. No. 32392): The localization in the neck of the femur is unusual. I will summarize later my experience up to date with cysts in the upper end of the femur. Up to the present time this one is the largest, of longest duration and the only one upon which I operated personally. I look upon this as an example of unhealed bone cyst. From the thinness of the bone shell found at operation it is remarkable there has been no fracture. The only evidence of ossification, as stated before, was in the portion of the bone cyst in the upper part of the shaft at the level of the lesser trochanter. I have described the bone shell. The remarkable feature was its smoothness on the inner side, no evidence of new bone formation when the periosteum was stripped from the outer side; practically no bleeding when the connective-tissue lining was removed.

CASE 2. (Pathol. No. 13831): The result after crushing of the bone shell in a large cyst of the upper end of hte tibia is here given.

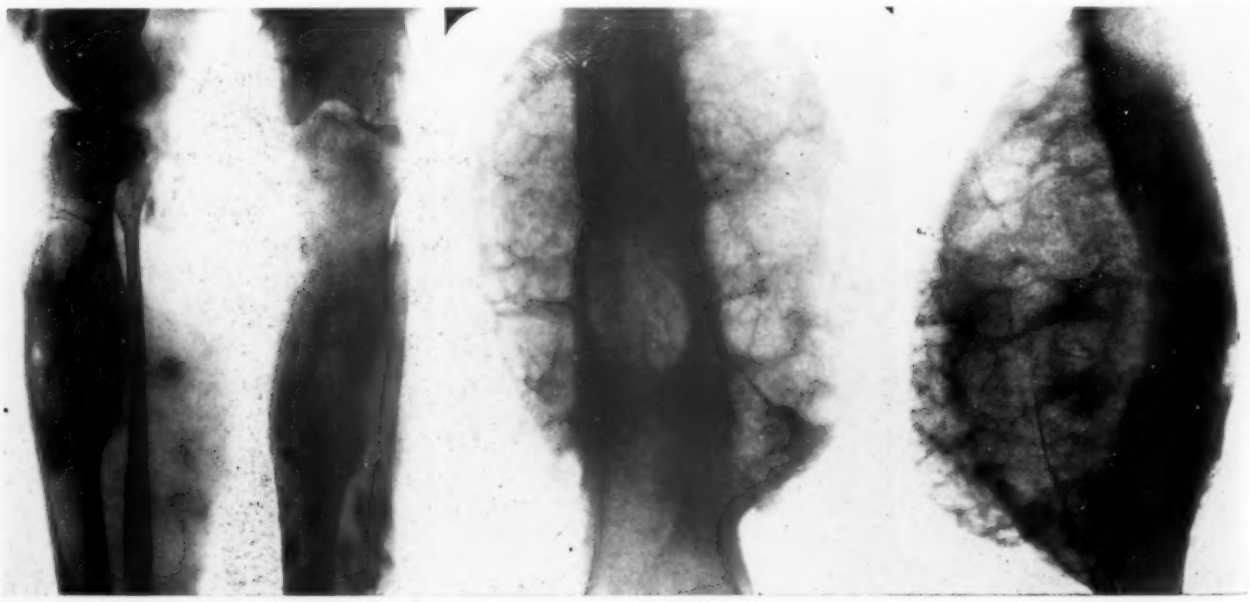
I operated on this patient in Milwaukee in March 1913, nine years ago, with the late Dr. Charles H. Lemon of Milwaukee.

Brief Summary: White boy, aged 16. Uniform swelling and expansion of the upper end of the tibia, beginning after contusion from a base ball. Operation: Removal of the connective-tissue lining, crushing of the bone shell; rapid ossification; Figures 7 and 8 are x-rays of result (1920) seven years after operation.

Clinical Note: Figure 4 (Pathol. No. 13831) is the x-ray taken just before operation. There is considerable expansion of the upper end of the tibia. The bone shell is thin. The upper portion of the bone cyst extends to within one centimeter of the epiphseal line and shows a fine line of ossification. Below the lower portion of the light shadow of the cyst there is a wide zone of ossification filling the marrow cavity.

This is an example of a bone cyst with fracture. First attention was called to it by swelling of the upper third of the tibia. There was practically no pain. The boy remembered that three years before operation the involved area was struck with a base ball, but it was six or eight months before any swelling was observed. The swelling has gradually increased without pain and interference with function. The diagnosis of benign bone cyst was made from the history and x-ray at that time.

Operation: The incision exposing the bone shell was made without an Esmarch. The veins over the periosteum were unusually dilated. Up to that time I had only observed such dilation of the veins when the lesion has been a giant-cell tumor. Now I know that it is frequently present in the large bone cysts. However, it was not observed in Case 1 here described. The



Figs. 7 and 8—Pathol. No. 13831. Case II. X-ray of result in case shown in Figure 4 six and one-half years after removing the connective-tissue lining and crushing the bone shell. The patient has a perfect result in 1923, ten years after operation.

Fig. 9—Pathol. No. 20209. Case III. X-ray, anteroposterior view of a huge bone cyst of the shaft of the femur. Patient aged 18; swelling one year. Patient of Dr. Prince of Rochester, N. Y. This x-ray suggested an osteochrondroma or myxoma.

Fig. 10—Pathol. No. 20209. Case III. Huge bone cyst of shaft of femur. Lateral view of the case shown in Figure 9.

shell of bone was dark like the bark of a tree and so thin that it gave parchment crepitation. On stripping back the periosteum there was no new bone formation. We could observe in the bone shell numerous minute perforations (See Fig. 5-e). On removing a piece of the bone shell, there exuded a rather thick, yellow fluid. Later we found that this was due to the presence of calcium in the fluid. The cavity of this bone cyst presented an appearance which I have never seen before or since. The surface of the connective-tissue lining was covered with a fine granular dust like fresh snow (See Fig. 5-a). This deposit could be scraped off with the knife and left a smooth red surface like the mucous membrane of the mouth. In removing the connective-tissue lining which varied in thickness (See Fig. 5) there were sand-like particles of bone between the connective-tissue lining and the bone shell, and above and below the bone cyst the marrow cavity was filled with new bone. The connective-tissue lining was leathery in consistency. In removing the connective-tissue lining there was some bleeding, and one small artery torn across spurted and was clamped and tied with a fine bit of silk. Therefore, in Case 2 the vascularity of the bone shell and its lining was much greater than in Case 1. All the connective-tissue lining was removed, but the new bone formation above and below was not disturbed.

Obliteration of the Bone Cavity: The cavity shown in the x-ray (Fig. 4) would have easily held two large hen's eggs. There were three methods of filling this cavity—fluid, blood clot or salt solution which is successful in small cavities; transplantation of bone; or crushing of the bone shell.

Fortunately I had recently read of the crushing of the bone shell, and this seemed easier than bone transplantation. There was no difficulty whatever in comminuting the shell, and now the tibia was fractured and could be moved in any direction. The crushed bone did not completely fill the cavity. The interspaces between the bone were filled with blood clot. The wound was closed without drainage and healed per primam. The gross and microscopic pathology of the connective-tissue lining, ostitis fibrosa, is shown in Figures 5 and 6.

Healing of the Fracture in Case 2 After Crushing of the Shell: Dr. Lemon wrote me that complete ossification took place in about the same time as an ordinary fracture of tibia would take. Within a few months the boy was walking without crutches or a dressing, riding a bicycle and playing base ball. The early x-rays taken after operation were not sent me, but Drs. Lemon and Eugene A. Smith who took the x-rays reported rapid and almost complete ossification.

X-ray December 1920: (Figs. 7 and 8). These two views were taken about six and one-half years after operation and it will be observed that there is very little expansion of the area affected by the cyst when compared with Figure 4, but the marrow shadow is not restored to normal; there is apparently some sclerosis. The dark areas in the soft parts are either artifacts, or represent misplaced periosteum which has formed little islands of bone.

Result (1923): Ten years well.

Remarks on Case 2: This observation illustrates the rapid ossification after the crushing of the bone shell. It also shows that the normal architecture of the bone has not been restored absolutely. We do not know the duration of this cyst. it may or may not have been present since the trauma. We do know that it was getting larger, and the chances are that if it had not been operated on, it either would have remained latent without increasing in size, or have grown larger into the group of huge bone cysts which up to the present time with one exception have had to be subjected to amputation.

Huge Bone Cysts

This group is relatively small and, as before the advent of the x-rays bone cysts were relatively rare but now are relatively frequent, we have additional evidence that the tendency of the bone cyst is toward spontaneous ossification.

In an unpublished pamphlet which I wrote in April 1903 for teaching surgical pathology, I find this statement after bone cysts: "These are rare tumors. We have observed no cases, except a dentigerous cyst in the lower jaw." When I wrote this pamphlet in 1903, Dr. Halsted's clinic in Johns Hopkins had been open thirteen years. There had been 14,000 surgical cases, 40,000 patients in the hospital, and 62 examples of primary bone tumors. At that time I had reviewed the literature on bone cysts. (*Progressive Medicine*, December

Fig. 11—Pathol. No. 20209. Case III. X-ray of result in the case of big bone cyst shown in Figures 9 and 10 seven years after operation, in which the fluid was evacuated, but the bone shell not crushed. Apparently the cyst shows ossification, but not complete. Dr. Prince reports good function in 1923.

Fig. 12—Pathol. No. 32199. Case IV. X-ray taken of bone cyst of upper end of femur involving trochanter, taken April, 1921. Boy aged thirteen years; duration of symptoms not given; no pathologic fracture. For result after noninterference see Figure 13.

Fig. 13—Pathol. No. 32199. Case IV. X-ray one year and nine months after the x-ray shown in Figure 12. This illustrates how rapidly a bone cyst may grow.

1899, page 235, and again in December 1902).

In the *Annals of Surgery* for August 1910, seven years later, I was able to review 89 cases classified as bone cysts. Many of these were from the literature. The first case observed and operated upon by me was in 1903, after the first pamphlet was written. All of the examples of large bone cysts are described and illustrated in the *Annals of Surgery*, and it seems unnecessary to reproduce the pictures here, or to go into the details of their history.

It is important, however, to again refer to the fact that two of them in which the huge cyst occupied the lower end of the femur, were subjected to a partial subperiosteal removal. In both instances the hemorrhage was profuse, in one the patient's life was saved by immediate amputation, the other patient died of hemorrhage without amputation.

The other two cases are autopsy specimens sent me by the late Dr. Roswell Park, from his museum.

In the *Journal of Radiology* for March 1920 I illustrated two further examples of huge bone cysts.

Figure 13 (Pathol. No. 20646) shows a huge bone cyst of the lower end of the femur. In this case a diagnosis of sarcoma was made and a hip-joint amputation performed in 1914. This patient is well in 1923, seven years later.

Figure 14 (Pathol. No. 20209) shows a very large cyst of the shaft of the femur which will be reported here in detail, because amputation was not performed, and we have been able to follow the partial healing of the cyst after an operation consisting of evacuation of the fluid only.

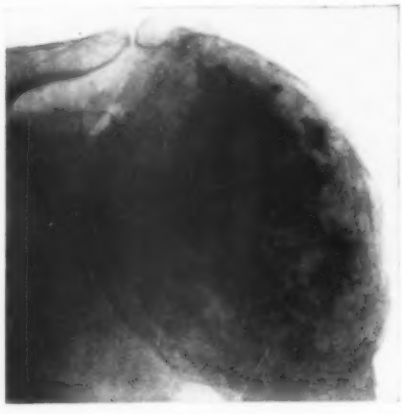


Fig. 14—Pathol. No. 32153. Case V. X-ray of a huge bone cyst of thirty-eight years' duration. Patient of Dr. R. B. Morris, Olean, N. Y. There is almost complete ossification; the joint is ankylosed.

CASE 3. (Pathol. No. 20209): Huge bone cyst of the shaft of the femur. This patient was a white female, aged 18. She spoke very little English. The swelling had been present one year, since an injury. There had been little or no pain, and very little loss of function.

X-ray Study: Figures 9 and 10 show the two views of this unusual tumor. In Figure 9, the antero-posterior view, we see the shaft of the femur surrounded by a shadow of bone formation. In the center of the shaft of the femur there is a light area. The outer outline of the periosteal growth does not show a smooth unbroken bone shell. I had never seen a bone cyst with the outline of the shaft preserved as in this case. The picture suggested an osteochondroma. In the lateral view we can observe that the shaft of the femur is involved, and it shows cavity formation, which would not be expected in a periosteal osteochondroma. On palpation one could feel a distinct bone shell beneath the muscles.

Operation: September 6, 1916, Rochester Clinic, N. Y. with Dr. H. L. Prince. Knowing the danger from hemorrhage if there is much subperiosteal exposure of the bone shell in these large cysts, I made a small incision through skin, fat and muscle fascia, and stripped back the periosteum. The bone shell was dark in color, but even from this small exposure there was a good deal of oozing of blood. On removing a small piece of the shell the bone cavity contained a slightly blood-stained serum under no pressure. Having excluded a giant-cell tumor and any other type of bone tumor requiring a radical operation, nothing more was done.

Microscopic Section: The Haversian canals of the piece of bone removed are filled with tissue resembling ostitis fibrosa.

Result (1923): Almost seven years after operation, Dr. Prince writes that the palpable mass is no larger, probably smaller; there is no pain or inconvenience. The x-ray (Fig. 11) shows some ossification, but not complete.

Remarks on Case 2: In view of the reported experiences with two cases of large bone cysts, it would seem justifiable to leave this cyst alone, unless x-rays or palpation demonstrate that it is getting larger. Should the cyst get larger, I believe the method of attack should be a crushing operation. This can be done with very little periosteal stripping. As I review the operation in the two previous cases, I get the impression that the operators were attempting to remove as much of the bone shell as possible and did not have in mind crushing the bone shell.

CASE 4. (Pathol. No. 32199): Bone cyst of upper end of femur which has grown to considerable size in twenty-one months. (Figs. 12 and 13.)

Dr. C. B. Francisco of Kansas City writes me that I saw the x-ray in Figure 12 in April 1921, and the boy, aged 13; the duration of the symptoms are not given. He tells me that I advised against operation. The second x-ray (Fig. 13) was taken one year and nine months later and illustrates how rapidly a bone cyst may

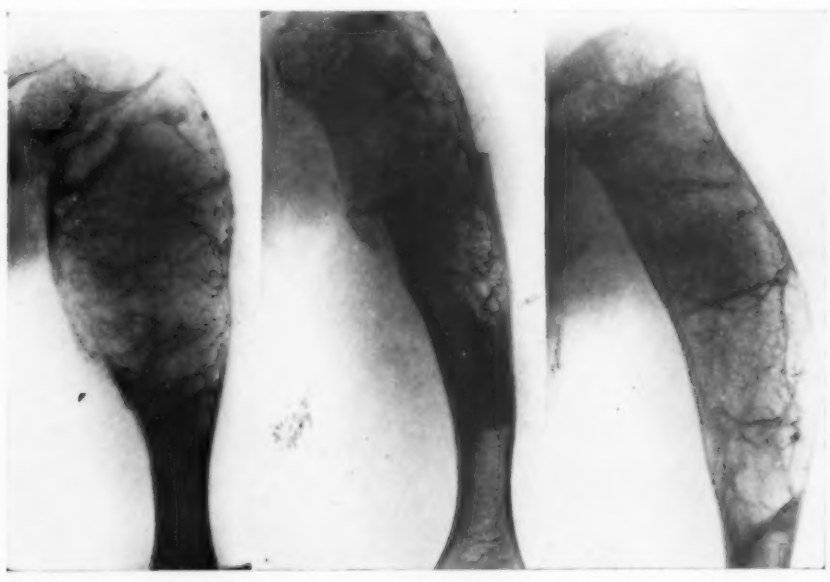


Fig. 15—Pathol. No. 28393. Case VI. X-ray of big bone cyst of upper end of humerus. Boy, aged twelve (?); swelling eighteen months. Patient of Dr. Harvey G. Mudd of St. Louis, Mo. X-ray taken October, 1919. See Figures 16 and 17 for result.

Fig. 16—Pathol. No. 28393. Case VI. X-ray June, 1920, eight months after x-ray in Figure 16, showing pathological fracture.

Fig. 17—Pathol. 28393. Case VI. X-ray September, 1921, almost two years after x-ray shown in Figure 15, and about three years and six months after onset. Pathological fracture shown in Figure 16 has healed; the cyst is no smaller; ossification is incomplete. Dr. Mudd writes in 1922 that the patient has good function.

grow, especially when there is no fracture.

Unfortunately I made no copy of what suggestions I made in this case, and I fear that I was misunderstood.

The x-ray in Figure 12, with a known age of thirteen, practically excludes a malignant central bone tumor. One would place such a child on crutches, improve the general condition if indicated, and if further x-ray pictures show no ossification or enlargement of the cyst, immediate operation would be indicated. On the receipt of the x-ray shown in Figure 13 operation was advised. This was in January 1923, and there has been no report since. One, however, could not have a better example of what may happen to a benign bone cyst if there is no fracture and no operation. But I will illustrate later that in a cyst the size of that shown in Figure 12, spontaneous ossification with complete restoration to normal may take place. So one is justified to delay under careful x-ray supervision. It was undoubtedly my fault that I did not make myself clear to Dr. Francisco and put my suggestions in writing.

CASE 5. (Pathol. No. 32153): Figure 14 is an x-ray of a patient observed by Dr. R. B. Morris of Olean, N. Y., in January 1923. The x-ray (Fig. 14) shows a huge cyst of the upper end of the humerus which is largely ossified. When the patient was a boy, thirty-eight years ago, there was an injury to this shoulder, without fracture, followed by gradual swelling of the upper end of the bone. Two years later a shoulder-joint amputation was advised. This operation was refused and after a time the enlargement ceased, but the shoulder-joint became ankylosed. The patient now has fair function, even with the ankylosed joint.

This case, therefore, demonstrates again what may happen in a small percentage of bone cysts in which there is no fracture and no operation.

CASE 6. (Pathol. No. 28393): Figures 15, 16 and 17 illustrate a large bone cyst of the upper end of the humerus which did not ossify after a fracture and is still large and unosssified about five years after onset. This patient was observed by Dr. Harvey G. Mudd of St. Louis, who saw the boy in October 1919 and took the x-ray shown in Figure 15. There was a history of swelling of the upper half of the humerus, of eighteen months' duration. An operation was performed October 15, 1919, removing a small piece of a thin shell of bone and letting out clear fluid. There was no connective-tissue lining. It is interesting to note that this case of Dr. Mudd corresponds to the one I first operated on in 1903. My operation was no more extensive than Dr. Mudd's, yet complete ossification and restoration to normal was observed in ten years and is still present after twenty years. In Dr. Mudd's case this good result did not take place, because in Figure 16 taken in June 1920, eight months later, there is a pathological fracture, and the one taken in September 1921 (Fig. 17) shows as yet no ossification, except in the fracture.

I have observed this slow ossification in cysts of this kind in the upper end of the humerus with and without operation, and I am convinced that quicker and better results will be obtained if x-ray examinations show absence of ossification or increasing expansion, and when one operates, one should not be content with the removal of a small piece of the bone shell and evacuating the fluid, and stripping the connective-tissue lining, but one should completely, or partially crush the bone shell. I feel very positive from my observations that this method of attack is established.

CONCLUSIONS

I have now covered the problems outlined for this paper: First, the methods of diagnosis; second, the method of attack, with emphasis on the crushing of the bone shell; and I have again emphasized that in a small number of bone cysts left alone there may be no ossification, or very little, or with or without ossification the cyst may gradually reach a great size when it not only interferes with function but makes the operation to restore the bone to normal dangerous and, in some instances, impossible.

Therefore, it is of the utmost importance that every case diagnosed bone cyst and which—on account of its size, localization, age of the patient or the presence of fracture—allows one to postpone operation, the patient should be carefully followed with frequent x-ray examinations, so that operation can be resorted to the moment it is indicated. When one operates, it must be remembered that a fracture and best a comminuted fracture (i. e., the crushing of the bone shell) is the method of attack which promises the most complete healing in the shortest space of time.

Pericarditis With Effusion*

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ACUTE pericarditis with effusion occurs most frequently as a complication of the acute infectious diseases, especially acute articular rheumatism and pneumonia, but it may follow a focus of infection anywhere in the body, or contiguous infections, as empyema, etc. Christian, in a study of 53 patients with acute pericarditis, found that 17 of these had at the time, or had recently had, acute articular rheumatism. Stone, in 300 necropsies on pneumonia patients at Fort Riley, found pericarditis present in 74 cases. Fourteen had seropurulent effusions; 44, acute purulent; and 14, acute fibrinoplastic purulent effusions. The amount of fluid varied from 100 to 1,000 c.c., the average being about 350 c.c. in 26 recorded cases. Pericarditis in 54 per cent of the cases was associated with empyema on the left side, in 20 per cent with empyema on the right side. We realize that both pericardial and pleural involvement were more frequent in this epidemic than in the usual run of cases.

The fluid may be serous, serofibrinous, seropurulent, or hemorrhagic, dependent usually on the etiological factors. Chronic pericarditis with effusion, except as a later development, is rare. It is seen more frequently in advanced tuberculosis than in any other chronic infection. Very large effusions are occasionally due to sarcoma or carcinoma metastasis, or may occur in the late stages of leukemia and Hodkgin's disease.

The history is not of great value usually. Pain over the precordium and dyspnea are the most constant complaints, but pain usually subsides as fluid accumulates. Neither, however, occurs with sufficient regularity to be of much value. Before the effusion has reached an amount greater than 150 to 250 c.c., the diagnosis is almost entirely dependent on a to and fro friction rub heard over the

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 8, 1922.

precordium. This is also, in many instances, heard throughout the disease.

After the amount of fluid reaches 200 c.c. or more, the most important physical signs are (1) a to and fro friction rub, (2) extension of the cardiac dulness upward and to the left, (3) substernal dulness, (4) broadening of the heart shadow, (5) physical signs of an area of compressed lung near the angle of the scapula on the left side, and (6) a pushing down of the left lobe of the liver.

Auenbrugger's, Rotch's, Ewart's, Ebstein's, Bamberger's, and Pin's signs are of little practical value in the diagnosis.

Williamson, in a study of the physical signs states:

"1. In pericarditis with effusion the fluid accumulates earliest in the costodiaphragmatic angle. This is manifested clinically in all but very small effusions by a pushing down of the left lobe of the liver which serves as a useful diagnostic criterion.

2. This sign can nearly always be observed before any rounding of the cardiohepatic angle or any increase in the great vessel dulness occurs. The extent to which the edge of the liver is depressed amounts to about two finger-breadths with effusions of 500 to 600 c.c.

3. A pericardial friction rub not only may but does persist with fairly large effusions in about two-thirds of the cases. This is especially true when for any reason there is a disproportionately large heart, so that the latter organ comes into close apposition with the sternum.

4. Pressure signs over the lungs posteriorly occur only with much larger effusions than the signs already enumerated."

Christian, however, believes that dulness near the angle of the scapula on the left side, with broncho-vesicular or bronchial breathing, and broncho-phony are very early signs of effusion and may be present when there is only a small quantity of fluid.

Morris and Bader injected the pericardium of four cadavers, using 250, 500, 750, up to 1,500 c.c. of ascitic fluid, and found that the first change on percussion was an increase in the cardiac dulness upward, this amounting to a rise in dulness from the third to the second rib before there was any change to either side. This was usually found after as much as 250 c.c. of the fluid had been injected. Distinct retrosternal dulness occurred in three of the cadavers after an injection of 500 c.c., but in the fourth this was not demonstrable until after 750 c.c. was used. Their cases were not examined in the erect posture. All of the cadavers were also x-rayed with the body lying flat on the back with the x-ray plate posteriorly. With the appearance of retrosternal dulness there was a progressive widening of the mediastinal shadow in the roentgenogram and a general increase in the width of the heart shadow. In none did they find an obtuse cardiohepatic angle. They believe that with a tensely distended pericardium, marked shifting of the dulness with change in position could not be expected. We have, however, not found this to be the case. In the very large effusions the change amounted to 2 or 3 cm. or more. Several areas should be measured, as the greatest change in width of the shadow is not always in the same plane.

Williamson has evidently perfected the technique of liver percussion to a degree that is far beyond the average clinician; and though the pushing down of the left lobe of the liver is undoubtedly an invaluable sign of fluid within the pericardium, the detection of changes in liver dulness of a finger's breadth is always obliged to carry a large percentage of error. The to and fro friction rub can usually be distinguished from a double murmur or pleuropericardial friction, but at times a definite differentiation is extremely difficult.

The roentgen ray has its greatest usefulness in cases where there is an effusion of more than 150 to 200 c.c. in showing approximately the amount of fluid present and in determining the best location for paracentesis. Occasionally when there is a moderate amount of fluid in the pleural space or consolidation in the lung and no to and fro friction present, a diagnosis without the roentgen ray is practically impossible.

Holmes has shown that when the heart is suspended in solutions with a specific gravity between 1.012 and 1.020, its outline cannot be made out by the x-ray. He found an absence of pulsation on fluoroscopic examination about as frequently in markedly dilated hearts as when there was a large effusion. In pericardial effusions the cardiohepatic angle was sometimes acute, sometimes obtuse, and sometimes obliterated. He found this to be equally true in markedly dilated hearts. The angle is more apt to be obliterated if the patient is examined in the upright position. He found an obliteration in the normal outline of the various chambers of the heart in nearly all cases; also that the dulness lies higher toward the sternal notch and is wider at the base when the patient is in the prone position. He was unable to see the outline of the heart shadow within the pericardium in any case.

We have studied rather carefully sixteen cases of pericarditis with effusion. The diagnosis was in fourteen of these checked by necropsy or pericardial tapping. In twelve cases there was 200 or more c.c. present, and in ten of these the x-ray showed definite indications of fluid within the pericardium. Of the five cases not

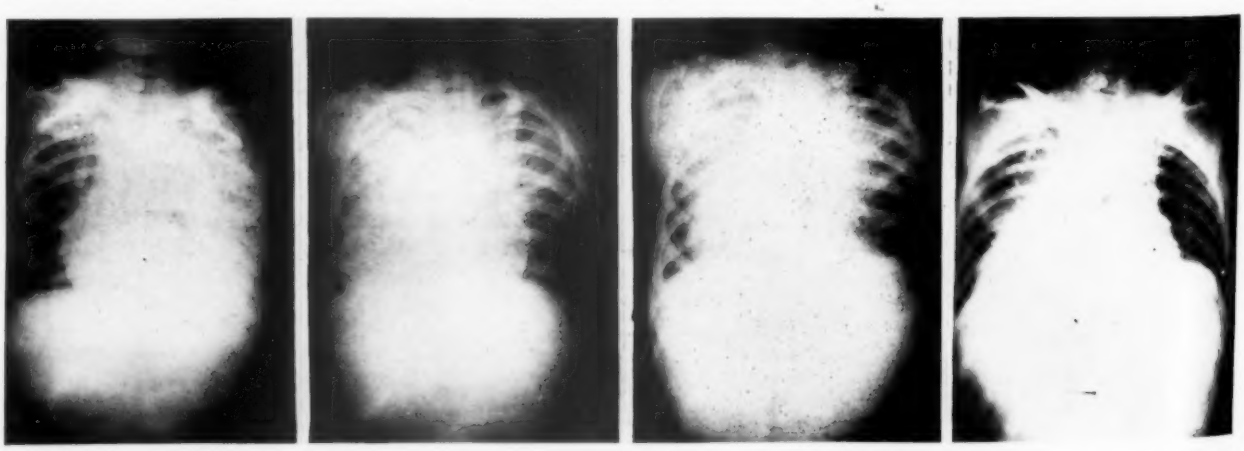

Fig. 1—**A**, Boy aged 12. Large pericardial effusion following tonsillitis. **B**, After removal of 500 c.c. of fluid. **C**, After removal of another 500 c.c. Complete recovery.

Fig. 2—Large effusion. Extreme dyspnea. Removal of 500 c.c. Patient recovered.

diagnosed by the x-ray, four were in pneumonia patients where the amount of fluid was less than 200 c.c. In these, plates were made only with the patient in the supine position and showed no definite change in the heart or mediastinal shadow. The fifth patient had a very large empyema on the left side. Unless there were definite contraindications, examinations after inspiration and expiration were made with the patient in the erect, supine, and prone positions. The constant findings were (1) a general increase in the width of the cardiac outline, (2) a widening of the mediastinal shadow which changed with change in position of the patient, (3) a straightening out of the curves of the left border of the heart, (4) the absence of or weak cardiac pulsations noted on the fluoroscopic screen, (5) a change in the space formed by the diaphragm, spine, and posterior border of the heart, (6) a bulging of the heart shadow upward and to the left, (7) extension of the mediastinal borders as more or less straight lines up to the clavicle, and (8) in some of the acute fairly large effusions, a hazy more dense appearance to the lung shadow about opposite the angle of the left scapula. (This was more marked with the patient in the prone or supine position, and was less pronounced or absent in the chronic cases).

Where a large pleural effusion accompanies fluid within the pericardium, it is of course impossible to make out the heart outline on the affected side. In one case a large pneumothorax seemed to exert an unequal pressure on the upper part of the mediastinum. In this patient, though we were sure of a pericardial effusion, a widening or change in the width of the mediastinal shadow could not be shown. Autopsy two days later showed the presence of 450 c.c. of purulent effusion. There were no pleuropericardial or mediastinal adhesions. When there are pleuropericardial and mediastinal adhesions, the pericardium may contain several hundred c.c. of fluid and show but very little, if any, change in the mediastinal shadow. Tumor of the pericardium with fluid will give the changes above noted, but the contour will usually be irregular. Some of the patients examined were too ill for us to obtain a perfectly satisfactory fluoroscopic examination. The only definite information obtained from this examination was a change in the space formed by the posterior border of the heart, the diaphragm, and the spine. We have not placed a great deal of dependence on what appeared to be changes in this space, since a markedly dilated heart or tumor may give a very confusing shadow.

The diagnosis of pericarditis is of twofold importance. First, there is so frequently an endocarditis and myocarditis associated with it; and secondly, even though a paracentesis of the pericardium is not usually necessary, whenever it is indicated marked relief of circulatory embarrassment is obtained. Williamson reports that necropsies on two very large pericardial effusions showed that death was due to pressure of the fluid on the auricles, and felt that paracentesis would have been life-saving in both instances. In our series, paracentesis pericardii was done nine times on six different patients and gave marked relief of symptoms in each instance.

Kuno, Lewis, and others have shown that the venous pressure in the heart increases very regularly in proportion to the amount of fluid placed in the pericardial space, but that the arterial pressure decreases very slightly until a large amount of fluid has accumulated. After a certain point, however, it reduces very rapidly. An effusion does its harm by preventing full diastolic distension of the heart. It is for this reason that tapping the periardium gives such relief in some cases.

The roentgen ray is certainly of far more value in the diagnosis of fluid within the pericardium than is credited it by many eminent internists. This is almost certainly due to the fact that negative or positive opinions are routinely given by roentgenologists from either the usual flat plate or a pair of stereoscopic plates made with the patient in one position.

> To quote Christian: "Roentgen ray studies in pericarditis have not given very much information. The physical signs are behind the heart shadow and in rotating the body to get a better view you get tangled up with the shadow of the vertebral column and do not get a good picture. The roentgen ray has not helped us much in detecting fluid in the pericardial sack. The roentgenologist diagnoses its presence from the silhouette of the heart. In my experience, there usually is no fluid. My reason for saying that, is that those particular cases diagnosed as pericardial effusions by the roentgenologist often terminate fatally and at necropsy you do not find fluid. I have a number of such cases recorded."

Many other clinicians have about the same opinion. Lichty, Stone, Norris and Landis, Da Costa, and others, however, have great faith in the roentgen ray in the diagnosis of this condition.

A negative diagnosis when there is a fair amount of fluid present is more frequently excusable than is a positive diagnosis when there is no fluid present. In the differential diagnosis of pericarditis with effusion from a dilated heart, some mediastinal tumors, and mediastinal pleurisy, the change in the contour of the shadow with change in the position of the patient is at times the only information of value which can be obtained from the roentgenogram. Naturally, the same positions and same tube-plate distances should be used. A history and regard for the physical examination is not necessary in a great deal of our work, but due regard for these

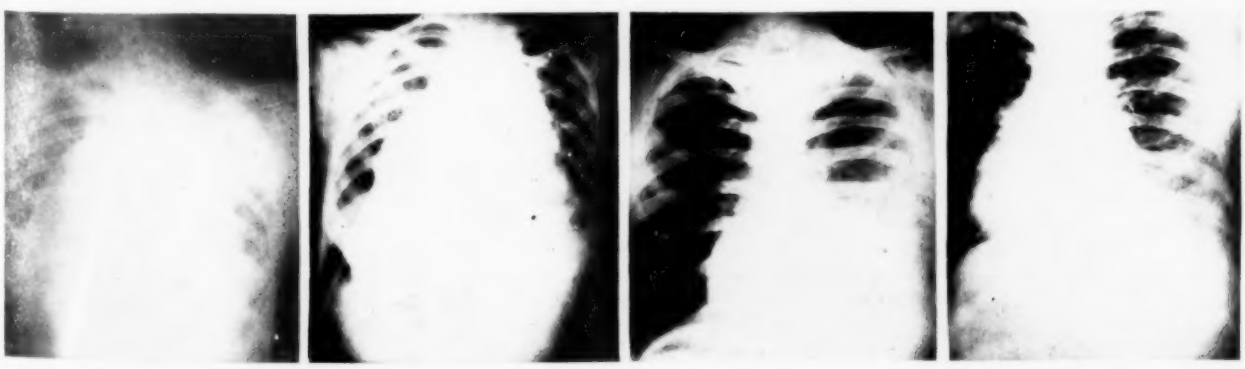

Fig. 3—**A**, Girl aged 18. Sarcoma of pericardium. Very large effusion. Pone position. **B**, Erect position. After plate was made 1,350 c.c. of serosanguinous fluid removed. Marked temporary relief of symptoms.

Fig. 4—**A**, Mediastinal shadow normal. Right side empyema. **B**, One week later. The pleura has been drained. Fairly large pericardial effusion.

in many cases of pericarditis will enable the roentgenologist to make a diagnosis without which his interpretation would be incomplete, since it is not always possible to get all the positions, angles, and views we would like.

Summary

1. Before the amount of fluid in the pericardium has reached 200 or more c.c., the diagnosis depends almost entirely on the presence of a to and fro friction rub heard over the precordium.

2. After a fairly large amount of fluid is present, the most constant and dependable physical signs are a persisting to and fro friction rub, extension of the cardiac dulness upward on the left side, substernal dulness which changes with change in the position of the patient, broadening of the heart shadow, the physical signs of an area of compressed lung near the angle of the scapula on the left side, and a pushing down of the left lobe of the liver.

3. The x-ray is of little value before 200 or more c.c. of fluid has accumulated. With greater amounts, widening of the mediastinal shadow, a bulging of this shadow upward and to the left, widening of the heart shadow, obliteration of the normal curves of the borders of the heart, extension of the mediastinal borders as more or less straight lines up to the clavicle, and a change in the contour of the heart shadow with change in position of the patient can be determined more accurately by x-ray than by any other means. When there is some fluid in the pleural space or consolidation in the lung, a correct diagnosis may be made when it is practically impossible by any other means.

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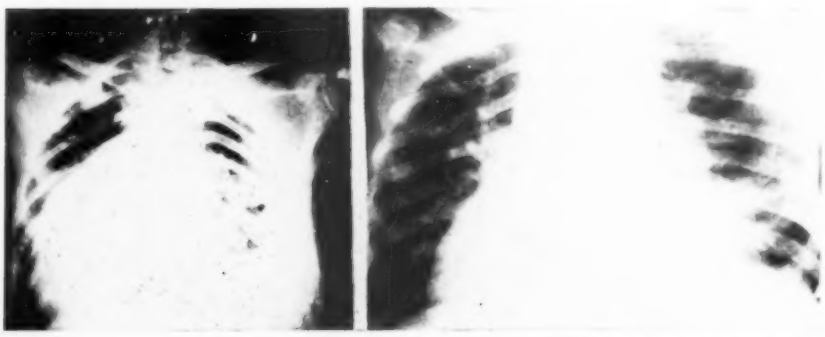

Fig. 5—Pneumothorax. Mediastinal shadow not particularly broad. Large heart shadow. Necropsy two days later showed presence of 450 c.c. of purulent fluid in pericardium.
Fig. 6—Boy, aged 10. Hodgkin's disease. Note the borders of the mediastinal shadow. They are practically straight lines which extend up the clavicle. There is no inward curve at the aortic arch. This appearance is very suggestive of fluid within the pericardium.

The Holfelder Technique in Deep Therapy

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I wish to present to you, today, the details of a therapy technique developed by Dr. Hans Holfelder, of the Schmieden Clinic, in Frankfurt. The technique is new in that it has not been practiced in America, although it has been in use in Germany for over two years.

There are, at present, two general methods of application of the x-rays for deep therapeutic purposes. One is the Dessauer technique, the other is the "turn it on and let it run an hour" plan. No attack upon the latter method is necessary, nor is it possible to defend it, but if deep therapy is to take its place with other recognized procedures, we must eliminate haphazard and unscientific methods as rapidly as possible.

The successful treatment of malignant disease by x-rays depends largely upon the fulfillment of a comparatively simple requirement; namely, all cells in the area under treatment must be subjected to identical physical conditions; that is, quantitative and qualitative homogeneity are essential. This proposition is more exactly stated in the basic principles laid down by Dessauer:

1. The basis of deep therapy is founded upon the biological experience that different cell forms exhibit different sensibilities to x-rays.

2. Different cell sensibilities are manifested to different degrees of hardness of x-rays.

3. These differences in sensibility depend upon the production of a homogeneous field

4. Heterogeneity is detrimental and success cannot be expected if the degree of heterogeneity exceeds the difference in sensibility between the normal and pathological cells. This is the "law of effective action", and may be stated thus:

$I \times T \times Sp > I \times T \times Sn$,

in which I is the intensity of radiation, T is the time of application, Sp is the degree of sensibility of the pathological cells, and Sn is that of the normal cells.

5. Homogeneity must be both qualitative and quantitative. For practical purposes rays are homogeneous if their intensities do not vary more than five per cent.

6. When the field is homogeneous the reaction of the different cells depends upon the degree of hardness of the x-rays.

We have thus established as axiomatic the proposition that homogeneity, both qualitative and quantitative, is the prime essential in deep therapy.

Light and x-rays obey the same physical laws, and if we construct a phantom and study the effect of distance on the intensity of light and the relation of homogeneity to the number and positions of the light cones entering the phantom, we may assume that the same effects will obtain if we substitute cones of x-rays for the light cones. To study these factors, we may construct such a phantom, using a glass tank containing a milky fluid, and lamps within truncated pyramids the sides of which are opaque. If we now cause two such cones of light to illuminate the liquid we see at the point of contact a light-intensity considerably in excess of the intensity of either cone (Fig. 1). If we assume the same picture for x-rays, this means that it is in this light zone that we are in danger of giving a burning dose. If we remove the fields from each other, and increase the angle between them, (Fig. 2), the distribution of light is improved but at the expense of the intensity in the depth; and the distribution of the light is not yet equal. If we oppose the two cones, (Fig. 3), we will readily see that the light intensity is much greater at the edges of the field than in the depth. If, however, we take three fields, each making an angle of 120° with its neighbor, (Fig. 4), there results a quite even distribution of the light in the depth. If we may assume that the same phenomena will occur when cones of x-rays are substituted for the light cones, it becomes apparent that radiation through two fields will not satisfy the requirement of homogeneity. If we continue the experiments upon the phantom we will find that homogeneity may be obtained by the use of three, five or seven fields. Thus, we are forced to return to cross-firing. For experimental purposes Dessauer constructed in his laboratory a phantom containing a series of trays coated with a fluorescent substance, by means of which the path of a cone of x-rays could be traced. On this phantom he was able to demonstrate that accurate or even fairly accurate cross-firing with moderately small fields was a practical impossibility.

If, therefore, we are to use multiple fields, we must have some means for the accurate location of the fields, and for the direction of the ray-cones. But must we use multiple fields? Can we not obtain practical homogeneity by the use of great target-skin-distances, large fields, heavy filtration, high voltages, etc? If we assume again that the distribution of x-ray energy in the body is comparable to that of light energy in the phantom it seems doubtful that homogeneity may be obtained by the use of two fields. If we grant its possibility however, there remain other considerations of equally great importance. We know little of the functions of the various ductless glands; we know little of the effect of radiating large quantities of blood; the effect of radiation on the kidneys, and on the secretions of the gastro-intestinal tract is not clear. Are we justified in radiating large areas of the body, or should we confine, as much as possible, the radiant energy to the diseased area? Should the adrenals and the spleen be destroyed in radiating a pyloric carcinoma? Must we radiate the heart in order to apply an efficient dose to a lung tumor? Holfelder radiated a patient for a gastric cancer. Following the treatment the patient grew worse rather rapidly and died. Another similar case developed Addison's disease. A postmortem examination of this patient showed a destruction of the cortical cells of the adrenals. In conjunction with the biologist, Peiper, Holfelder then undertook the study of the irradiated adrenals of dogs, and found that a dose greater than 70 per cent ESD was sufficient to cause destruction of the cortical cells. Clinically such destruction is accompanied by apathy, adynamia, and more rapid growth of carcinoma cells. A final important consideration is that Holfelder has recently completed the measurement of several thousand ray beams by an improved iontoquantimeter, and has demonstrated the incorrectness of the distribution of x-rays shown in the Dessauer curves.

To meet these conditions, Holfelder has devised the field selector, an instrument which enables us to attain actual homogeneity, to use smaller fields, and to accurately direct the ray-cones to the part to be treated, avoiding important organs which should not be radiated. He has adopted the indication, "percentage depth dose", and for practical purposes we may disregard such depth-intensity indications as the "μ-coefficient", "weakening coefficient", etc. The percentage depth dose is the

Fig. 1.

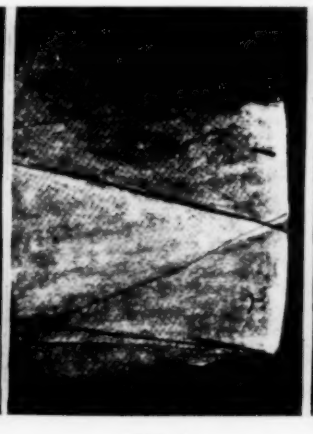

Fig. 2.

Fig. 3.

Fig. 4.

amount of radiation 10 cm. in the depth in relation to the surface dose, expressed in terms of percentage, and may be calculated by the formula:

$$\frac{I' \times 100}{I^2} = \text{P. D. D.}$$

Proz. Tiefendosis.	<	20%	<	<	25%	<	<	30%	<	<	35%	<	<	40%	<	<	45%	Proz. Tiefendosis.
F.H.A. 25 cm.	6x8	8x10	9x12	10x15	15x15 20x20	--	--	--	--	--	--	--	--	--	--	--	--	F.H.A. 25 cm.
30 cm.	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	--	--	--	--	--	--	--	30 cm.
40 cm.	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	--	--	--	--	--	--	40 cm.
50 cm.	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	--	--	--	--	50 cm.
60 cm.	--	--	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	--	--	60 cm.
70 cm.	--	--	--	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	--	70 cm.
80 cm.	--	--	--	--	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	--	80 cm.
90 cm.	--	--	--	--	--	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	--	90 cm.
100 cm.	--	--	--	--	--	--	--	--	--	--	6x8	8x10	9x12	10x15	15x15	20x20	--	100 cm.

Fig. 5.

I' being the discharge time of the iontoquantimeter with given factors, and I^2 the discharge time with the same factors in a 10 cm. depth. Holfelder believes that the varying degrees of hardness produced by increasing the thickness of an already heavy filter (i. e. the difference between rays passed through 0.8 mm. copper, and those passed through 1.0 mm. copper) are not important biologically, and in using the field selector the various percentage depth doses are produced by varying the size of the field and the target-skin distance, the voltage and filtration remaining constant. Figure 5 shows the effect on the percentage depth dose of varying the field and the distance. The figures are not correct for all installations and must be verified and corrected before the table may be used.

The field selector consists of a series of "trial fields", which are truncated triangles made of photographically tinted celluloid; (Fig. 6), and an illuminated glass plate on which is printed a series of geometrical figures of varying density and of the same color as the trial fields. The tint of the trial fields progresses from dark to light from above downward, in carefully calculated percentages, the various degrees of intensity of color corresponding to various percentages of the ESD. They are calculated for depth dose percentages of 15, 20, 25, 30, 35, 40, and 45 per cent, each percentage depth dose having a number of trial fields. On the illuminated glass plate are a great number of figures, squares, triangles, points, and circles. Each square, each triangle, each point and each circle is of exactly the same tint, but the circles are much darker than the points, the points are darker than the squares, and the triangles are the lightest of all. If we superimpose a trial field upon the plate of the field selector, say a 25 per cent field, we will see that near its lower border all of the figures may be seen, while at its upper border only the points and circles are visible. When the triangles disappear, a dose of 35 per cent ESD has been surpassed, the quandrangles are no longer visible when an intensity of 70 per cent is reached; at 110 per cent the points disappear, and all figures are invisible at 135 per cent.

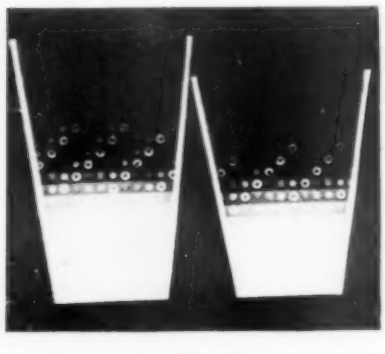

Fig. 6.

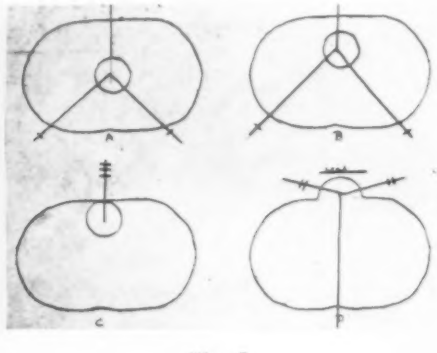

Fig. 7.

The method of application is as follows: By means of caliper measurements and by molding a strip of block tin to the contours of the body a cross-section of the body at the level of the tumor is constructed on the plate of the field selector. By the aid of information obtained at operation, by flouroscopy and x-ray plates, palpation and other clinical means, and with the assistance of a cross-section anatomy, the tumor is located on the section, and the organs seen in such a section are drawn in. The trial fields are chosen by experience, combined with certain fundamental principles which may be briefly outlined: To a centrally located tumor, three fields of equal intensity are applied, with an angle of 120° between each pair of fields (Fig. 7A). To an acentrally located tumor is applied one field of greater intensity from the nearest side and two fields of equal lesser intensity, each field

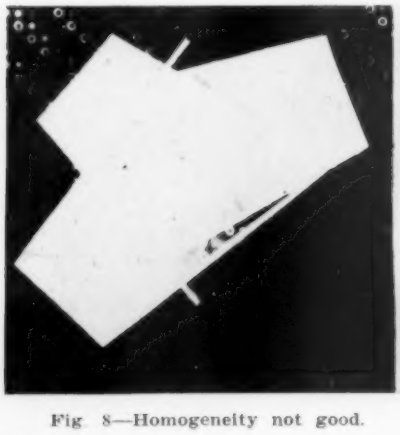

Fig. 8—Homogeneity not good.

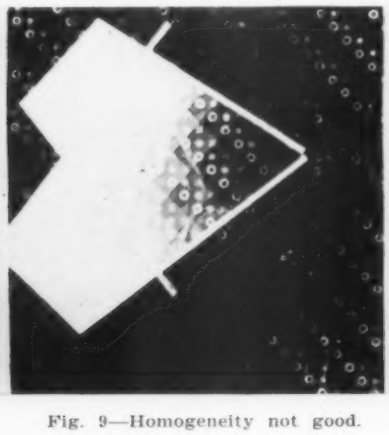

Fig. 9—Homogeneity not good.

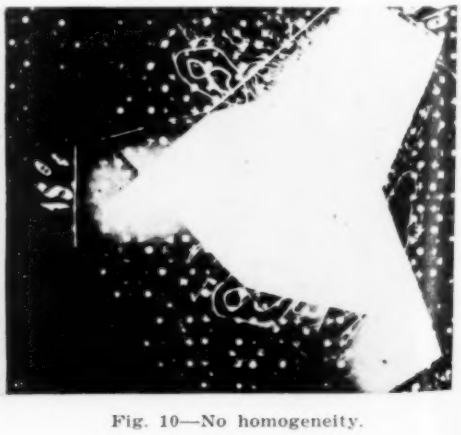

Fig. 10—No homogeneity.

making an angle of 120° with its neighbor (Fig. 7B). Having an extremely eccentric tumor, located immediately under the skin, cross-firing is not attempted because of the danger of skin injury. For these cases a single field of great intensity is used at a very great target skin distance (100 cm.) with two tubes radiating the same area simultaneously (Fig. 7C). When a tumor projects above the skin, the surface of the tumor is protected with lead, and two fields of great intensity are applied obliquely, with one field of less intensity from the opposite side (Fig. 7D). Bearing in mind these general principles, we may select the trial fields by trial and error. The fields are arranged on the field selector plate so that the area to be irradiated is covered, the homogeneity is judged and the degree of intensity in the radiated field is calculated. With some practice, the error is less than five per cent. If the homogeneity in the irradiated field is not good, (Figs. 8 and 9), one or more of the trial fields may be changed to fields of greater or lesser intensity, or the direction of the field may be altered, or the skin dose may be increased or decreased as indicated, until the required dose and an adequate homogeneity have been obtained. A piece of tracing paper is then placed on the plate of the field selector, the whole section, including the trial fields is drawn on the paper, and the fields are projected out into space beyond the limits of the section (Fig. 11). On the tracing is noted the percentage depth dose required for each field, and the percentage of an ESD delivered to each skin area is noted on each field. Now one selects one of a number of patterns which have been cut to fit the contours of various sections of various sized bodies, and adjusts it to fit the section under consideration (Fig. 12). The anterior field or fields are now projected onto their patterns, the posterior field or fields are cared for in a like manner. If this pattern be applied to the body at the level of the section, and the central beam is caused to pass parallel to the center of the plane field which was projected onto the pattern, it is obvious that the condition within the body will be identical with that produced on the field selector. If any important organs, the radiation of which is undesirable, appear in the section, the fields may be so applied as to cause these organs to be without the path of the direct radiation. In certain cases, in the radiation of pyloric carcinoma, carcinoma of the pancreas, etc., it becomes necessary to prepare sagittal sections in a like manner in order to avoid radiation of the adrenals (Fig. 13).

SUMMARY

(1) Homogeneity in the radiated area is a prime essential.

(2) Better homogeneity is obtained by using three or five fields than by the use of two or four.

(3) The use of small fields is necessary for the treatment of disease in certain regions.

(4) The Holfelder field selector offers a means of attaining better homogeneity.

(5) It permits of accurate cross-firing.

(6) It enables the ray-cones to be directed in such a manner as to avoid the radiation of important uninvolved organs.

(7) It therefore offers the most accurate and scientific means of applying x-rays for deep therapy.

820 Peoria Life Bldg.

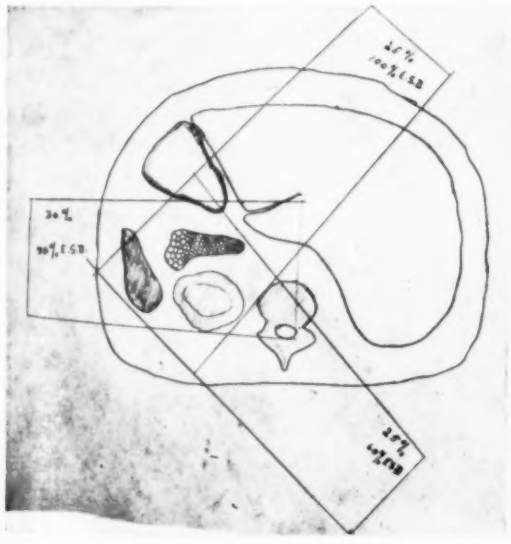

Fig. 11.

Fig. 12.

Fig. 13.

A System of Roentgen Ray Anthropometry (The Skull)*

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Chicago

PART III. SECTION A.
Descriptive Anthropologic Data.

No. 1. Name, Helen Q. Age, 24 years. Sex, female. Height, 5 feet 3 inches. Weight, 135 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The skull appears thicker than usual. A few teeth are missing. Not any of the sutures are clearly visible, neither is there any deformity suggestive of abnormal synostosis.

No. 2. Name, Mollie P. Age, 25 years. Sex, female. Height, 5 feet 4 inches. Weight, 160 pounds. Physical condition, good—excellent recovery from breast amputation July 9, 1920 (carcinoma). Clinical diagnosis, acute mania. Descriptive observation: The bones are of medium thickness; the thinnes of the lower jaw and the very obvious decay of teeth would suggest an age much older than her history shows. None of the coronal suture is visible. The second portion of the lambdoidal suture shows serrations partially occluded. There is complete absence of frontal sinuses. The skull is not deformed nor are there evidences of premature synostosis.

No. 3. Name, George A. Age, 50 years. Sex, male. Height, 5 feet 9 inches. Weight, 160 pounds. Physical condition, fair. Clinical diagnosis, dementia praecox. Descriptive observation: The skull is of medium thickness. There are evidences of pressure burrows on the inner aspect of the entire median sagittal section of the vault. The teeth are in good condition. The middle portion of the lambdoidal suture is barely visible. The frontal sinus is spacious and markedly protrudes. The vertex of the skull is flattened, tending slightly to scaphocephalic depression; from which premature occlusion of the sagittal suture is inferred.

No. 4. Name, J. W. M. Age, 45 years. Sex, male. Height, 5 feet 5 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The skull is below average thickness. Many teeth are missing. No part of the coronal suture is visible; and the second part of the lanbdoidal suture is much fused. There is a slight bulge at the bregma suggesting a tendency to acrocephaly. The frontal sinuses are absent, though the superciliary ridge is developed. There is a tendency to flattening from the occipital protuberance to the menton. In this case the sex evaluation is less than 21 though the actual sex is that of a male.

No. 5. Name, A. R. Age, 50 years. Sex, male. Height, 5 feet 8 inches. Weight, 140 pounds. Physical condition, poor. Clinical diagnosis, Paresis. Descriptive observation: The bones are of variable thickness, being in places quite thin and in other places markedly thick. The frontal and parietals in the region of the sagittal suture show burrowing, possibly of pressure. The teeth are in poor condition, many missing and some of the remaining ones showing decay. None of the coronal suture is visible; but the middle and third portions of the lambdoidal suture are clearly revealed. The general shape of the head does not argue for sutural synostosis. The critical sex values enumerated from the skull are clearly feminine; whereas the patient is a male. The clinical diagnosis is paresis.

No. 6. Name, S. A. Age, 40 years. Sex, male. Height, 5 feet 6 inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, mental deterioration. Descriptive observation: The bones are of average thickness. There are many teeth missing. The middle portion of the coronal suture is visible and the entire lambdoidal suture can be traced with apparent lack of fusion. There is a very gentle scaphocephalic indentation at the vertex.

No. 7. (No clinical record of this case.) Descriptive observation: Bones are of average thickness. None of the coronal nor lambdoidal sutures is visible. Pronounced scaphocephalic depression. Measurements not made owing to the opened mouth.

No. 8. Name, Christopher C. Age, 35 years. Sex, male. Height, 6 feet 0 inches. Weight, 165 pounds. Physical condition, good. Clinical diagnosis, dementia praecox (recovered). Descriptive observation: The bones are somewhat thicker than usual. Only part of the middle portion of the lambdoidal suture can be visualized, the serrations being mostly occluded by fusion. The teeth are good. There is a decided scaphocephalic indentation at the vertex. The direction from occipital protuberance to the menton is almost rectilinear. In this case it is interesting to observe a high sex evaluation corresponding to the true clinical sex of the patient; and with this high evaluation a reported recovered condition. There is almost a rectilinear line from the occipital protuberance to the menton.

No. 9. Name, Thomas W. Age, 30 years. Sex, male. Height, 5 feet 6 inches. Weight, 160 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The skull bones are thicker than usual. The teeth are in fair condition. None of the coronal suture is visible; but the second and third portions of the lambdoidal suture are clearly seen. The frontal sinus is entirely obliterated, though the superciliary ridge is prominent.

No. 10. Name, Santiago A. Age, 26 years. Sex, male. Height, 5 feet 3 inches. Weight, 120 pounds. Physical condition, (?). Clinical diagnosis, dementia praecox and tuberculosis. Descriptive observation: Skull bones of medium thickness. The teeth are in fair condition, only a few missing. The coronal suture is not observed; only a part of the middle portion of the lambdoidal suture can be visualized, though so fused as to present practically complete occlusion. The head tends to acrocephaly, pointing to sutural synostosis of the coronal. Frontal sinuses are absent, though there is a developed superciliary ridge.

No. 11. Name, Edwin J. R. Age, 24 years. Sex, male. Height, 5 feet 11 inches. Weight, 160 pounds. Physical condition, good. Clinical diagnosis, paresis. Descriptive observation: The bones are somewhat thick and osteoporotic. Both the coronal and lambdoidal sutures are visible. There is no evidence of unusual sutural synostosis. The teeth are in good condition. There is a straight line from the occipital protuberance to the menton.

No. 12. Name, Earl S. Age, 30 years. Sex, male. Height, 5 feet 7 inches. Weight, 145 pounds. Physical condition, poor. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are of average thickness. Some teeth are missing. Step-like depression at the lambda. None of the coronal suture is visible. The first, second and third portions of the lambdoidal suture are closely traced and are obviously unfused. Practically a straight line can be traced from the menton to the occipital prominence. The frontal sinus is entirely absent though there is present a pronounced supraorbital ridge.

*Continued from October, 1922.

No. 13. Name, G. H. S. Age, 25 years. Sex, male. Height, 5 feet 8 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, praecox—hebephrenic. Descriptive observation: The bones are of average thickness, eburnated on the inner surface, more markedly osteoporotic from the bregma to the lambda. The middle portion of the coronal suture and the entire lambdoidal suture can be visualized. The teeth are in poor condition. There is a flattening of the vertex indicative of scaphocephaly incident to premature synostosis of the median sagittal suture.

No. 14. Name, Wm. T. K. Age, 51 years. Sex, male. Height, 5 feet 6½ inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, homosexual. Descriptive observation: Bones, of average thickness. Teeth, in good condition. None of the coronal suture is visible. A fused middle portion of the lamboidal suture can be visualized. There is a clear preponderance in the relation of the head to face in favor of the head. The critical sex index is 20; a feminine critical sex index in a male patient. It is interesting to note the clinical diagnosis of homosexuality.

No. 15. Name, Leonard A. R. Age, 21 years. Sex, male. Height, 5 feet 10 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are not extraordinarily thick. There are signs of pressure erosion on the frontal and parietal bones near the median sagittal section. The teeth are poor, a number are missing. The coronal suture is not visualized; the median portion of the lambdoidal suture is visible but is partly occluded owing to fusion. The sex evaluation is below 21, contrary to the actual sex of the individual.

No. 16. Name, Joseph Z. Age, 40 years. Sex, male. Height, 5 feet 7 inches. Weight, 140 pounds. Physical condition good. Clinical diagnosis, paranoid dementia praecox—homosexual. Descriptive observation: The bones are thinner than in average normal. The head is irregular in outline. It shows pressure marks in the frontal region. It tends to brachycephaly. The teeth are in fair condition. No portion of either the coronal or the lambdoidal suture is visible.

No. 17. Name, Phillip N. Age, 36 years. Sex, male. Height, 6 feet. Weight, 200 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The skull bones are of average thickness. The teeth are in fair condition. Coronal suture is not visible; second portion of lambdoidal suture can be traced. Moderate flattening at the vertex suggests sagittal suture synostosis. There is almost a rectilinear line from the occipital protuberance to the menton. This individual, six feet tall and 200 pounds in weight, has a skeletal head evaluation below the critical sex index.

No. 18. Name, Morris Q. Age, 32 years. Sex, male. Height, 5 feet 5¼ inches. Weight, 128 pounds. Physical condition, good. Clinical diagnosis, toxic psychosis. Descriptive observation: Thin bones. Good teeth. The middle portion of the coronal suture and the entire lambdoidal suture are visible. The frontal sinus is congenitally absent. There is a scaphocephalic depression at the vertex suggesting median sagittal sutural synostosis. There is a straight line from the occipital protuberance to the menton. The sex evaluation is less than 21, though the individual is a male patient.

No. 19. Name, Bernard N. Age, 28 years. Sex, male. Height, 5 feet 5 inches. Weight, 140 pounds. Physical condition, fair. Clinical diagnosis, hebephrenic praecox. Descriptive observation: The bones are of average thickness, lambdoidal suture is visible in its middle part, coronal suture not seen. There is a straight line from the occipital protuberance to the menton. It is interesting to note the presence of the straight line from the protuberance to the chin together with the clinical diagnosis of hebephrenic praecox.

No. 20. Name, Frank M. Age, 32 years. Sex, male. Height, 5 feet 9 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, paresis. Descriptive observation: The bones are of average thickness. There is a scaphocephalic depression at the vault. Only a part of the lambdoidal suture can be seen. The teeth are poor. There is a straight line from the occipital protuberance to the menton.

No. 21. Name, Wm. C. L. Age, 35 years. Sex, male. Height, 5 feet 5 inches. Weight, 135 pounds. Physical condition, fair. Clinical diagnosis, paranoid dementia praecox. Descriptive observation: Bones, thin anteriorly and thick posteriorly; rickety ridge at the bregma: lambdoidal and coronal sutures visible. Slight tendency to scaphocephaly.

No. 22. Name, Thomas S. Age, 30 years. Sex, male. Height, 5 feet 9 inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, paarnoid dementia praecox—homosexual. Descriptive observation: The bones are everywhere thick in median sagittal section; lambdoidal suture just visible; teeth poor. There is a straight line from the occipital protuberance to the chin point.

No. 23. Name, Albert C. Age, 35 years. Sex, male. Height, 5 feet 10 inches. Weight, 175 pounds. Physical condition, good. Clinical diagnosis, alcoholic hallucinosis. Descriptive observation: The bones are of average thickness. The internal surface is irregular. The head is brachycephalic. The frontal sinuses are absent. There is a step-like elevation at the lambda. The lambdoidal suture is visible in its middle part. The critical sex index is 20.

No. 24. Name, Ralph H. Age, 25 years. Sex, male. Height, 5 feet 8 inches. Weight, 165 pounds. Physical condition, good. Clinical diagnosis, maniac depressive psychosis. Descriptive observation: The bones are thin. The coronal suture is barely visible in its middle portion; whereas the entire lambdoidal suture can be seen. The teeth are good. There is a flattening of the vertex suggesting a scaphocephalic tendency.

No. 25. Name, Otto J. S. Age, 31 years. Sex, male. Height, 5 feet 10½ inches. Weight, 170 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thin and irregular. There is some osteoporosis and pressure erosion in the frontal and parietal sagittal regions. The middle portion of the coronal suture is visible, as is also the entire lambdoidal suture.

No. 26. Name, Chris. P. Age, 60 years. Sex, male. Height, 5 feet 8 inches. Weight, 147 pounds. Physical condition, good. Clinical diagnosis, dementia praecox with syphilis. Descriptive observation: The bones are thin. The middle portion of the coronal and the entire lambdoidal suture are visible. There is a very slight flattening at the vault. The lambda is depressed. The teeth are fair.

No. 27. Name, Wm. L. W. Age, 23 years. Sex, male. Height, 5 feet 6 inches. Weight, 125 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The bones are of medium thickness, irregular and eburnated on the inner surface. They are osteoporotic. There is evidence of pressure erosion in the frontal sagittal regior. A part of the coronal suture is visible as is also the lambdoidal.

No. 28. Name, M. S. Age, 20 years. Sex, male. Height, 5 feet 6 inches. Weight, 136 pounds. Physical condition, good. Clinical diagnosis, catatonic dementia praecox. Descriptive observation: The bones are

of average thickness but obviously osteoporotic. The coronal suture is nowhere visible. The middle portion of the lambdoidal suture is in large part occluded, but can be traced. The teeth are in good condition. The head tends to brachycephaly. There is a straight line from the occipital protuberance to the chin.

No. 29. Name, Roland T. Age, 31 years. Sex, male. Height, 5 feet 4 inches. Weight, 120 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis—not homosexual. Descriptive observation: The bones are thicker than usual. There is an acute angle of Welcker and a very small sella. The coronal suture is barely visible in the middle portion. The lambdoidal suture is practically occluded though the course can be traced.

No. 30. Name, Alfred Y. Age, 27 years. Sex, male. Height, 5 feet 7 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, defective (praecox?). Descriptive observation: The bones are a little thicker than usual, irregular and slightly eburnated on their inner surface. There is a pronounced scaphocephalic depression at the vertex. The coronal suture is not visible. The middle portion of the lambdoidal is straightened and partly occluded. There is evidence of premature occlusion of the saggittal suture. The teeth are good. There is a moderate superciliary ridge with an infantile frontal sinus enclosed.

No. 31. Name, G. O'N. Age, 27 years. Sex, male. Height, 5 feet 6 inches. Weight, 140 pounds. Physical condition, fair. Clinical diagnosis, dementia praecox—hebephrenic. Descriptive observation: The bones are thin. All of the upper teeth and most of the lower teeth are missing. The median portion of the coronal suture is distinctly visible, as is also the entire lambdoidal suture. There is an obvious disproportion from head to face in favor of predominant cranium. There is practically a straight line from the occipital protuberance to the menton.

No. 32. Name, Urbin L. B. Age, 19 years. Sex, male. Height, 5 feet 6 inches. Weight 138 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are of average thickness. The teeth are good. None of the coronal suture is visible; but the median portion of the lambdoidal suture can be seen partly fused. The skull appears brachycephalic. There are signs of pressure erosion in the parietal near the median sagittal suture. In this case the critical index is just barely exceeded.

No. 33. Name, George N. Age, 32 years. Sex, male. Height, 5 feet 6 inches. Weight, 130 pounds. Physical condition, good. Clinical diagnosis, dementia praecox—hebephrenic. Descriptive observation: The bones are thin. The teeth are good. The second portion of the coronal suture and the entire lambdoidal suture can be seen. There is a straight line from the occipital protuberance to the menton. The head is brachycephalic and moderately acrocephalic. There is some pressure erosion in the frontal sagittal area.

No. 34. Name, Irene R. Age, 22 years. Sex, female. Height 5 feet 2 inches. Weight, 131 pounds. Physical condition, good. Clinical diagnosis, Mental defective state with excitement—not homosexual. Descriptive observation: The bones are of average thickness. None of the coronal suture is visible; and the median portion of the lambdoidal suture is faintly seen. The teeth are fair.

No. 35. Name, Hyman F. Age, 28 years. Sex, male. Height, 5 feet 5 inches. Weight, 130 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thin anteriorly and above average thickness posteriorly. They are everywhere osteoporotic in the median sagittal plane. Frontally and parietally there is marked evidence of pressure erosion. The coronal suture is visible. The entire lambdoidal suture can be seen. There is a moderate superciliary ridge with absence of frontal sinus. The teeth are in fair condition.

No. 36. Name, Clarence J. W. Age, 23 years. Sex, male. Height 5 feet 8 inches. Weight, 160 pounds. Physical condition, good. Clinical diagnosis, dementia praecox—hebephrenic. Descriptive observation: The bones are above average thickness. The internal surface is moderately eburnated. There are Pacchionian bodies along the median sagittal plane. There is a depression at the bregma. In the frontal sagittal region pressure erosion marks are visible. Only the middle portion of the coronal suture can be visualized. The middle portion of the lambdoidal suture is fused, though the course of this suture can be traced. The critical index is 20. There is a straight line from the occipital protuberance to the chin.

No. 37. Name, P. P. Age, 45 years. Sex, male. Height, 5 feet 8 inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, paranoid state. Descriptive observation: The bones are not thicker than usual. There is a scaphocephalic depression at the vertex. The middle portion of the lambdoidal suture can be plainly traced. The teeth are in fair condition. There is a straight line from the occipital protuberance to the menton.

No. 38. Name, Michael B. Age, 25 years. Sex, male. Height, 5 feet 4 inches. Weight, 120 pounds. Physical condition, fair. Clinical diagnosis, catatonic praecox. Descriptive observation: The bones are of average thickness, with moderate eburnation on the inner surface. There is considerable evidence of pressure erosion along the frontal and parietal sagittal regions. The middle portion of the coronal suture is barely visible. The middle portion of the lambdoidal suture is straightened and in part occluded. There is a straight line from the occipital point to the menton. The teeth are in poor condition.

No. 39. Name, Floyd D. Age, 23 years. Sex, male. Height, 5 feet 6 inches. Weight, 108 pounds. Physical condition, good. Clinical diagnosis, homosexual. Descriptive observation: The bones are thicker than average and everywhere osteoporotic. In the frontal parietal sagittal region there is evidence of pressure erosion. The coronal suture is visible in its middle portion. The lambdoidal suture is just visible in its middle portion. The teeth are good. The critical index is below 21.

No. 40. Name, James A. M. Age, 20 years. Sex, male. Height, 5 feet 6 inches. Weight, 130 pounds. Physical condition, fair. Clinical diagnosis, praecox—catatonic?. Descriptive observation: The bones are of average thickness. The teeth are poor. The entire lambdoidal suture is visualized. There is a moderate scaphocephalic indentation at the vertex, suggesting median sagittal sutural synostosis. There is a straight line from the occipital protuberance to the menton. The sex evaluation is for a female, though the individual is a male. There is a great preponderance of head over face. There are pressure erosions in the frontal near the median plane.

No. 41. Name, Charles G. S. Age, 24 years. Sex, male. Height, 5 feet 8 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thin; the teeth are poor. A portion of the coronal suture can be seen. The lambdoidal is partly obfuscated in the middle portion, which is the only visible part of this suture. There is a scaphocephalic depression at the vertex. There are signs of moderate pressure erosion in the frontal. There is a straight line from the occipital protuberance to the menton.

No. 42. Name, Santiago N. Age, 28 years. Sex, male. Height, 5 feet 4 inches. Weight, 125 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thin. The teeth are good. Neither the coronal nor lambdoidal suture is visible. The head is acrocephalic. There is pressure erosion in the parietal and frontal and calcification of the falx cerebri in the frontal and occipital region. This case should be eliminated from the studies by reason of foreign parentage.

No. 43. Name, Harry C. Age, 29 years. Sex, male, Height, 5 feet 6 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, homosexual. Descriptive observation: The bones are thick. The teeth are poor. Neither the coronal nor lambdoidal suture is visible. There is a scaphocephalic depression at the vertex with a frontal bulging, suggesting median sagittal and coronal sutural synostosis. There is a straight line from the occipital protuberance to the menton. This case bears a clinical diagnosis of homosexuality; that is a mental case in which homosexual trends are markedly developed and clinically elicited. Though a man, the sex evaluation falls on the critical index.

No. 44. Name, Albert W. Age, 25 years. Sex, male. Height, 5 feet 10 inches. Weight, 170 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are of average thickness. The teeth are good. A portion of the coronal and the middle part of the lambdoidal suture are visible. There is an occipital bulging. There is marked pressure erosion in the frontals. Some Pacchionian bodies project from the falx cerebri along its course. The line from the occipital protuberance to the menton is straight.

No. 45. Name, Sterling H., Age, 28 years. Sex, male. Height, 5 feet 5 inches. Weight, 135 pounds. Physical condition, fair. Clinical diagnosis, catatonic dementia praecox. Descriptive observation: The bones are of usual thickness; teeth in good condition. The middle portion of the coronal and lambdoidal sutures are both clearly visible. The head tends to scaphocephaly. The line from the occipital protuberance to the menton is practically straight.

No. 46. Name, Beni. L. Age, 26 years. Sex, male. Height, 5 feet 7 inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The bones are of average thickness with greatly uneven internal surface and marked erosion along the frontal, parietal and sagittal areas. The internal diploic edges appear eburnated. There is a congenital absence of the frontal sinuses. The coronal suture is visible in its median portion. The entire lambdoidal suture can be traced. The cranium is rounded so as to suggest an infantile hydrocephaly, and flattened on the vertex indicating a scaphocephaly. The critical sex index for this individual is 21.

No. 47. Name, Mary M. Age, 72 years. Sex, female. Height, 5 feet 4 inches. Weight, 82 pounds. Physical condition fair. Clinical diagnosis, senile dementia. Descriptive observation: The bones are thick; teeth, poor. Neither the coronal nor the lambdoidal suture is visible in any part.

No. 48. Name, Thomas E. K. Age, 20 years. Sex, male. Height, 5 feet 4 inches. Weight 150 pounds. Physical condition, good. Clinical diagnosis, confusion. Descriptive observation: The bones are thicker than average normal. The teeth are fair. No part of the coronal suture is visible. A small part of the middle portion of the lambdoidal suture is barely visible.

No. 49. Name, Joseph T. K. Age, 36 years. Sex, male. Height 5 feet 6 inches. Weight, 160 pounds. Physical condition, good. Clinical diagnosis, maniac depressive psychosis. Descriptive observation: This roentgenogram is not sufficiently satisfactory for diagnosis.

No. 50. Name, George G. Age, 36 years. Sex, male. Height, 5 feet 9½ inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The head is dominantly scaphocephalic. There is a flattening of the vault and a flattening of the occipital surface. The bones are of average thickness. The coronal suture is not visible. The lambdoidal suture is well serrated and plainly traced. The teeth are poor.

No. 51. Name, John N. Age, 34 years. Sex, male. Height, 5 feet 5 inches. Weight, 135 pounds. Physical condition, good. Clinical diagnosis, dementia praecox—hebephrenic. Descriptive observation: The bones are somewhat thicker than average and osteoporotic on their outer surface. The middle portion of the coronal suture is seen. The lambdoidal suture is in part occluded, though its course may be traced. There is a suggestion of pressure erosion, parietally and sagittally. The teeth are excellent. There is a straight line from the occipital protuberance to the menton.

No. 52. Name, Walter R. P. Age, 31 years. Sex, male. Height, 5 feet 10½ inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, paresis. Descriptive observation: The bones are of average thickness. There is a scaphocephalic depression of the vault. The middle portion of the coronal suture is almost completely occluded, though its course is faintly indicated. The lambdoidal suture is much straightened, the serrations lost, but its course easily traced.

No. 53. Name, Anna G. Age, 60 years. Sex, female. Height, 5 feet 3 inches. Weight, 120 pounds. Physical condition, poor. Clinical diagnosis, senile dementia. Descriptive observation: The bones are of average thickness though everywhere osteoporotic. The coronal suture can be traced. The lambdoidal suture can be traced with difficulty. There is evidence of pressure erosion in the frontal sagittal region. There is a straight line from the occipital protuberance to the menton.

No. 54. Name, Cora P. Age, 37 years. Sex, female. Height, 5 feet 2 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, epilepsy—homosexual. Descriptive observation: The bones are of average thickness. The lambdoidal suture is much straightened and occluded, though its course is visible. The teeth are in fair condition. There is an occipital flattening, and a straight line runs from the occipital protuberance to the menton. The head tends to brachycephaly.

No. 55. Name, Josephine G. Age, 40 years. Sex, female. Height, 5 feet 6 inches. Weight, 140 pounds. Physical condition, fair. Clinical diagnosis, diabetes. Descriptive observation: The skull is of average thickness. Only a portion of the lambdoidal suture is visible. Teeth, extremely poor; the lower jaw practically edentulous. Vertex is flattened. There is practically a straight line from the occipital protuberance to the menton.

No. 56. Name, Mildred C. Age, 29 years. Sex, female. Height, (?). Weight, 129 pounds, Physical condition, excellent. Clinical diagnosis, dementia praecox—hebephrenic. Descriptive observation: The bones are slightly thicker than average. There are evidences of pressure erosion in the frontal region. A portion of the lambdoidal suture is visible, though faintly. The teeth are good. There is a straight line from the occipital protuberance to the menton. The critical sex value is 21.

No. 57. Name, Ethel D. Age, 36 years, Sex, female. Height, 5 feet 4½ inches. Weight, 106 pounds. Physical condition, fair. Clinical diagnosis, homosexual. Descriptive observation: The bones are thicker than

usual. The lambdoidal suture is barely visible. There is a slight scaphocephalic indentation at the vertex. The teeth are in a fair condition. The critical sex index is 21.

No. 58. Name, Mary M. Age, 40 years. Sex, female. Height, 5 feet 4 inches. Weight, 130 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observations: The bones are of average thickness and irregular on the inner surface in the median plane. The lambdoidal suture is visible. The head tends to scaphocephaly. There is a straight line from the occipital protuberance to the basion. The patient is practically edentulous.

No. 59. Name, Ada F. Age, 48 years. Sex, female. Height, (?). Weight, 179 pounds. Physical condition, good. Clinical diagnosis, secondary dementia following an attack of acute melancholia. Descriptive observation. The bones are of uneven thickness and show eburnation on the inner surface. The cranium is preponderantly masculine in sharp distinction to the feminine face. The lower jaw is practically edentulous and many teeth are missing from the upper jaw. There is almost a straight line from the occipital protuberance to the point of the chin. Neither the coronal nor the lambdoidal suture is visible.

No. 60. Name, Elizabeth H. Age, 33 years. Sex, female. Height 5 feet 3¾ inches. Weight, 106 pounds. Physical condition, excellent. Clinical diagnosis, dementia praecox. Descriptive observation:—This picture is too poor for reading. Unsatisfactory x-ray.

No. 61. Name, Florence M. Age, 53 years. Sex, female. Height, 5 feet 2 inches. Weight, 150 pounds. Physical condition, excellent. Clinical diagnosis, paranoid dementia praecox. Descriptive observation:—This x-ray is rejected because of race. (Colored).

No. 62. Name, Mattie F. Age, 19 years. Sex, female. Height, 5 feet 0 inches. Weight, 100 pounds. Physical condition, good. Clinical diagnosis, homosexual. Descriptive observation: The bones are of average thickness. A statement as to the condition of the sutures is not valuable because of the poorness of the x-ray.

No. 63. Name, Annie L. Age, 36 years. Sex, female. Height, 5 feet 2¾ inches. Weight, 132 pounds. Physical condition, fair. Clinical diagnosis, dementia praecox. Descriptive observation: — Description discarded because of race. (Colored).

No. 64. Name, Amander D. Age, 44 years. Sex, female. Height, 5 feet 5 inches. Weight, 120 pounds. Physical condition, good. Clinical diagnosis, homosexual. Descriptive observation:—Excluded because of race. (Colored).

No. 65. Name, Maud M. Age, 37 years. Sex, female. Height, 5 feet 6 inches. Weight, 92 pounds. Physical condition, good. Clinical diagnosis, paranoid dementia praecox. Descriptive observation: The bones are of average thickness. The coronal suture can not be seen. The lambdoidal suture can be traced in its entire course. The teeth are fair. There is a scaphocephalic depression at the vault, though the head is not dominantly scaphocephalic.

No. 66. Name, Mary W. Age, 50 years. Sex, female. Height, 5 feet 3¾ inches. Weight, 132 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thick and irregular. In the frontal region they show marks of pressure erosion. Coronal suture can not be traced. The lambdoidal suture is barely visible. The teeth are in poor condition. The sella is practically completely closed although the angle of Welcker is markedly acute. There is a straight line from the occipital protuberance to the menton.

No. 67. Name, Mary B. Age 56 years. Sex, female. Height, 5 feet 8 inches. Weight, 115 pounds. Physical condition, fair. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thicker than average normal and markedly irregular especially on their inner surface. There is a moderate pressure erosion in the frontal region. The teeth are poor, the lower jaw and upper jaw being virtually edentulous. No part of the coronal suture is seen. The lambdoidal suture has lost its serrations, is straightened and barely visible. There is a straight line from the occipital protuberance to the menton.

No. 68. Name, Elizabeth B. Mc. Age, 65 years. Sex, female. Height, 5 feet 6¾ inches. Weight, 161 pounds. Physical condition, good. Clinical diagnosis, paranoid state of dementia praecox. Descriptive observation: The bones are somewhat thicker than average. The inner surface is eburnated. A part of the middle portion of the coronal suture is visible. The course of the lambdoidal suture can barely be traced. There is marked osteoporosis everywhere and evidence of pressure erosion in the frontal sagittal region. The teeth are extremely poor. There is a straight line from the occipital protuberance to the menton.

No. 69. Name, Florence N. Age, 79 years. Sex, female. Height, 5 feet 7 inches. Weight, 100 pounds. Physical condition, good. Clinical diagnosis, dementia praecox, Descriptive observation: The bones are thicker than average normal. There is marked pressure erosion in the frontal region. The cranium is preponderantly larger than the face. The teeth are fair.

No. 70. Name, Claudine S. Age, 30 years. Sex, female. Height 5 feet 5 inches. Weight, 130 pounds. Physical condition, poor. Clinical diagnosis, maniac depressive. Descriptive observation: Excluded because of race. (Colored).

No. 71. Name, Margaret B. Age, 49 years. Sex, female. Height, 5 feet 7 inches. Weight, 140 pounds. Physical condition, good. Clinical diagnosis, paranoid dementia praecox. Descriptive observation: No film for this case.

No. 72. (No clinical record given of case.) Descriptive observation: The bones are of average thickness. Only a portion of the lambdoidal suture is visible. The teeth are fair. There is no clinical record of this case.

No. 73. Name, Emma K. Age 50 years. Sex, female. Height, 5 feet 2 inches. Weight, 120 pounds. Physical condition, fair. Clinical diagnosis, toxic psychosis. Descriptive observation: The bones are of average thickness. There is an osteoporotic area in the region of the bregma. The frontal region is somewhat acrocephalic. The teeth are poor. No portion of the coronal suture is visible. The lambdoidal suture can be traced in its entire middle portion.

No. 74. Name, Fanny G. Age, 48 years. Sex, female. Height, 5 feet 7½ inches. Weight, 144 pounds. Physical condition, excellent. Clinical diagnosis, homosexual. Descriptive observation: The bones are of average thickness though uneven. There is a bare scaphocephalic depression at the vertex and a rickety ridge at the lambda. The coronal suture is not visualized. Only the middle portion of the lambdoidal suture can be traced. The jaw is practically edentulous, both upper and lower.

No. 75. Name, Elsie B. Age, 50 years. Sex, female. Height, (?). Weight, 118 pounds. Physical condition, good. Clinical diagnosis, maniac depressive. Descriptive observation: The bones are somewhat thicker than average normal, porotic and eburnated on their inner surface. No part of the coronal suture can be seen; and the lambdoidal suture is practically entirely occluded, the course being occasionally indicated. The teeth are good.

No. 76. Name, Fannie R. Age, 35 years. Sex, female. Height, 5 feet 2 inches. Weight, 120 pounds. Physical condition, poor. Clinical diagnosis, maniac depressive, Descriptive ob-

servation: (There is no film in this case).

No. 77. Name, Blanche W. Age, 47 years. Sex, female. Height, 5 feet 6 inches. Weight, 159 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The bones are of average thickness. Neither the coronal nor the lambdoidal suture can be traced. The teeth are poor.

No. 78. Name, Teresa G. Age, 59 years. Sex, female. Height, 5 feet 3 inches. Weight, 111 pounds. Physical condition, good. Clinical diagnosis, maniac depressive insanity. Descriptive observation: The bones are thin anteriorly and thick posteriorly. There is a general osteoporosis probably incident to age. All of the teeth are missing. Neither the coronal nor the lambdoidal suture can be seen.

No. 79. Name, Harriett S. Age, 58 years. Sex, female. Height, 5 feet 5 inches. Weight, 150 pounds. Physical condition, good. Clinical diagnosis, constitutional psycopath. Descriptive observation: The bones are of average thickness. The subject is practically edentulous. The film is too poor to interpret.

No. 80. Name, Grizell B. Age, 55 years. Sex, female. Height, 5 feet 8 inches. Weight, 110 pounds. Physical condition, good. Clinical diagnosis, (?). Descriptive observation: The bones are of average thickness and irregular on the inner surface. There is an area of osteoporosity at the endobregma. The coronal suture cannot be traced. Only occasional portions of the lambdoidal suture can be seen. All of the teeth are missing.

No. 81. Name, May W. Age, 47 years. Sex, female. Height, 5 feet 4 inches. Weight, 119½ pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are thicker than average normal. No portion of the coronal suture can be seen. The middle portion of the lambdoidal suture is plain though straightened. The teeth are good. The head tends to scaphocephaly.

No. 82. Name, Margaret G. Age, 41 years. Sex, female. Height, 5 feet 3 inches. Weight, 97 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The bones are of average thickness. The head is dominantly brachycephalic and well rounded. Only a portion of the lambdoidal suture can be traced. The teeth are poor.

No. 83. (No clinical record nor film in this case.)

No. 84. Name, Amy B. Age, 51 years. Sex, female. Height, 5 feet 4½ inches. Weight, 112 pounds. Physical condition, good. Clinical diagnosis, pre-senile psychosis. Descriptive observation: The bones are of average thickness. The middle portion of the coronal suture can be traced, as can also parts of the middle portion of the lambdoidal suture. The teeth are bad.

No. 85. Name, Annie A. Age, 48 years. Sex, female. Height, 5 feet 5½ inches. Weight, 121 pounds. Physical condition, good. Clinical diagnosis, hysteria. Descriptive observation: The bones are of average thickness. Neither the coronal nor lambdoidal suture can be seen. The teeth are poor. The head tends to a moderate scaphocephaly, deepening at the vertex.

No. 86. Name, Julia M. Age, 23 years. Sex, female. Height, 5 feet 1¾ inches. Weight, 103 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation: The bones are of average thickness anteriorly but much thickened posteriorly. They are irregular on the inner surface. There is evidence of pressure erosion at the frontal sagittal region. The coronal suture can not be traced. The lambdoidal suture is everywhere plain. Excellent teeth. There is a straight line from the occipital protuberance to the menton.

No. 87. Name, Bertha S. Age, 44 years. Sex, female. Height, 4 feet 11¾ inches. Weight 136 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are of average thickness. Very marked arterial ducts are observed from the post bregma downward and anteriorly. No part of the coronal suture can be seen. Only an occasional portion of the middle portion of the lambdoidal suture is visualized. The subject is practically edentulous.

No. 88. Name, Kate M. Age, 48 years. Sex, female. Height, 5 feet 3 inches. Weight, 107 pounds. Physical condition, poor. Clinical diagnosis, paranoid dementia praecox. Descriptive observation: The bones are somewhat thicker than usual. The middle portion of the coronal suture and practically the entire lambdoidal suture are clearly visible. Only a very small frontal sinus is observed. The teeth are in poor condition, many missing, and the rest carious. There is no evidence of pathologic sutural synostosis.

No. 89. Name, Myrian H. Age 30 years. Sex, female. Height, 5 feet 0 inches. Weight, 117 pounds. Physical condition, good. Clinical diagnosis, dementia praecox. Descriptive observation: The bones are of average thickness in front but somewhat thicker than normal posteriorly. There is a rickety ridge at the lambda. The head is brachycephalic. The middle portion of the coronal suture can barely be visualized. The lambdoidal suture is plainly seen. The teeth are good. There is an absence of frontal sinus though a slight superciliary ridge.

No. 90. Name, Adelaide H. Age, 58 years. Sex, female. Height, 5 feet 1½ inches. Weight, 115 pounds. Physical condition, poor. Clinical diagnosis, catatonic dementia praecox. Descriptive observation: The bones are markedly osteoporotic with eburnated internal surfaces. The head is dominantly brachycephalic. There is a straight line from the occipital protuberance to the menton. The middle portion of the coronal suture can be seen, as can also the middle portion of the lambdoidal. The teeth are good.

No. 91. (No clinical record given of case.) Descriptive observation: The bones are of average thickness. Both jaws are edentulous. No sutures are observed. There is no clinical record of this case. The extremely thin lower jaw and the total occlusion of sutures suggests old age.

No. 92. Name, Elizabeth G. Age, 48 years. Sex, female. Height, 5 feet 1½ inches. Weight, 104 pounds. Physical condition, good. Clinical diagnosis, undifferentiated psychosis. Descriptive observation· The bones are of average thickness. There is an occipital bulge. The coronal suture can not be seen. The middle portion of the lambdoidal suture is visualized. The teeth are fair.

No. 93. Name, Amelia T. Age, 50 years. Sex, female. Height, 5 feet 7 inches. Weight, 135 pounds. Physical condition, poor. Clinical diagnosis, epilepsy. Descriptive observation: The bones are thicker than normal. The cranium is preponderantly large in relation to the face. The middle portion of the lambdoidal suture can be traced. Many teeth are missing. There is a tendency to scaphocephaly.

No. 94. Name, Mattie H. Age, 51 years. Sex, female. Height, 5 feet 3 inches. Weight, 115 pounds. Physical condition, poor. Clinical diagnosis, epilepsy. Descriptive observation: The bones are of average thickness. The sutures can not be differentiated. The teeth are poor.

No. 95. Name, Blanche N. Age, 15 years. Sex, female. Height, 5 feet 4 inches. Weight, 125 pounds. Physical condition, good. Clinical observation, epilepsy. Descriptive observation: The bones are thin anterior to the bregma and somewhat thicker posteriorly. The lambdoidal suture can

barely be traced. The teeth are excellent.

No. 96. Name J. D. L. Age, 27 years. Sex, male. Height, 5 feet 2 inches. Weight, 133 pounds. Physical condition, good. Clinical diagnosis, (?). Descriptive observation: The bones are of average thickness, though everywhere osteoporotic. The middle portion of the coronal suture can be seen. The entire lambdoidal suture can be visualized. The teeth are excellent.

No. 97. Name, Ethel T. Age, 41 years. Sex, female. Height, 5 feet 4¾ inches. Weight 113½ pounds. Physical condition, good. Clinical diagnosis, epilepsy. Descriptive observation: The bones are of average thickness. The middle portion of the coronal suture and a part of the lambdoidal suture are visible. The teeth are good. There is no evidence of abnormal synostosis. A marked prognathism involves the superior and inferior jaw bones. The frontal sinuses are absent. The frontal region shows some pressure burrowing.

Objections to the Use of "One Lethal Dose" Method in Malignancy

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LOOK, if you please, at the medical lore of the last ten years. You see this statement: "The lethal dose should be given at one sitting", or, "If it is not practicable to give the entire dose at one sitting, it should be given in as short a time as possible."

These statements, with a ringing in of slight variations, have been repeated until it would seem that, convinced by reason of this very repetition, many have commenced to believe them. . . .

It is the purpose of this paper to take issue with this dictum and to show from the writings and experience of the profession that the use of the term "one lethal dose" is unscientific and illogical.

There are two theories as to the effects of x-rays on cancer cells. The "lethal dose group", if we may so call it, believes that the cell is killed by direct action of the ray, acting more efficiently perhaps, when the cell is in active karyokinesis. The other group holds that the death of the cell is secondary, being brought about largely by the vascular changes induced by the treatment. These changes in the blood and blood vessels allow the cells to starve, as it were.

The writer believes that both elements enter into the death of the cell, but that the action on the supporting tissue and blood is of more importance than the effect on the cell itself.

Caspary, as quoted by Levin[1], has reported success in preventing cancer inoculations by previous raying of the site of the inoculation with small doses of x-rays. Levin goes on to state: "All the experiences related confirm that in the fight against cancer we must stimulate the organism as a whole in addition to our local measures." His experiments indicate that the leucocytes and lymphocytes are active agents in this induced immunity.

The experiments of Murphy and Hussey[2] showed that heavy x-ray exposure for two hours on one-half of a tumor from a mouse made practically no difference in the number of takes after inoculation as compared with inoculations of the half of the tumor not thus treated. Furthermore, grafts from a non-radiated tumor placed on different areas of the same mouse failed to grow only when the area of inoculation had received previous radiation. The same results were not obtained in deep tissues.

These experiments demonstrate well that simple exposure of cancer cells to x-rays in accordance with a set of formulae devised by Seitz and Wintz, or anyone else, is insufficient as a method for the cure of cancer.

Now, turning to those who depend on the effect of the rays on the supporting tissues, Ewing[3] states:

> "1. When a practioner possessing a small amount of radium applies it to a rodent ulcer in repeated small doses over a period of weeks he usually observes the disappearance of the tumor and very often it never recurs. Meantime, the skin shows little reaction and the scar is small or absent. Exactly what he has done no one knows, but he has not killed any cancer cells. Sections taken at intervals through tissue so treated show hyperchromatism of nuclei and hydropic swelling of tumor cell bodies followed by gradual atrophy of the cells. At the same time the surrounding tissues become active, leucocytes emigrate, lymphocytes and plasma cells appear, capillaries proliferate and all these invade and replace the tumor mass. A slow, regressive process with degeneration of tumor cells, and a progressive process with exudation and proliferation of normal tissues are set going, and as a result of these processes the tumor is cured.
>
> "2. When larger amounts of silver-filtered radium are used the same course of events is observed. Some superficial tumor cells may suffer immediate necrosis, but tissue sections show that the bulk of the tumor is removed by a very rich exudate of lymphocytes and plasma cells and by active growth of new capillaries which surround and compress much of the deeper parts and mechanically extrude the outer layers of the degenerating tumor cells. In many cases of this type I have failed to find many killed or necrotic cells, but have been able to trace all stages of the atrophy of degenerating tumor cells in the mass of reacting proliferating tissue. It is clear that the reaction of the tissue is an essential factor in the curative process. Under some circumstances, when this reaction fails, no amount of radiation succeeds in killing the tumor cells. I have seen recurrent rodent ulcer very heavily radiated, with necrotic stroma tissue, supporting well stained and apparently viable tumor cells. Every radiologist is familiar with these indolent reactionless cancerous ulcers which resist all efforts at cure and have to be excised or burned out.
>
> "The simple morphological interpretation of the changes reveals the highly important fact that in treating cancer by physical agents we are not merely killing cancer cells, in the sense of the physicist, nor extirpating it entirely, according to the surgeon's plan, but rather are calling upon Nature's forces to accomplish the cure. On this account we may assert that physical

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, Dec. 6, 1922.

therapy, although still lacking some essential elements of an ideal method, is, to some extent, a rational therapy of cancer as far as we know the disease."

This statement is the clearest and most convincing that has appeared in the literature and if taken seriously would indicate not only that to try to give a lethal dose at one sitting would not be advisable, but, on the contrary, such a course would be going contrary to all of our knowledge as gained from the microscopic study of irradiated tissues. Such a course also would be going against common custom in the matter of dosage as practised not only by the more conservative followers of the divided dose method, but also, as will later be shown, contrary to the common practise of those who advocate the "lethal dose" in their published writings.

The tissue changes as described are so in accord with the common experience of those employing radiation that they cannot fail to bear the imprint of truth. Many writers profess a belief in the "lethal dose", but their writings contradict themselves. In most cases, their own technique belies their writings. Take Pfahler, for instance. In an article on radiotherapy in carcinoma of the breast, he says, "theoretically it would be desirable to give a massive dose of radiation over the mammary region and the glandular areas leading therefrom at a single massive dose."

Now, what we desire to bring out is that theoretically giving such a massive dose would be the height of folly. To prove our contention we only need to read further in the same article the technique of the author himself to find that he thinks so too:

> "Each application is the equivalent of two-thirds of an erythema dose. Each of the areas is treated again during the second week so that the second radiation over each area is given a week from the first and each of the three areas receives two of these treatments within a period of two weeks. In other words, one and one-third erythema dose of deep radiation is given within a period of two weeks. If one adds to the direct action of the rays to these areas the secondary effect from the treatment through the other two areas, we must conclude that we are probably getting during this first two weeks apparently two erythema doses which is more radiation than could possibly be carried into the tissues by any other method. Some one may criticise this technique because a full erythema does is not carried into each of these fields immediately, but by such process one would probably produce dermatitis and would certainly not be able to give more than half the amount of radiation within a period of a month. This technique has been developed after much experience, but will probably be modified in the near future."

The purpose of the writer is not to give a long, drawn out, hairsplitting, ultrascientific dissertation which begins at zero and ends at infinity, but it is to bring out a few salient points which have been evolved from the experience of the large number of x-ray workers in this country especially. When these experiences and facts have been weighed and analyzed we try to shape our course toward further advancement in the treatment of malignant disease.

We shall not in this article dwell on the necessity of proper distance, proper screening and proper use of various portals of entry to get the greatest proportion of rays into the area to be effected.

An article by Hirsch[1] is the best analysis that has come to our notice of the various factors that enter into the proper treatment of malignant disease. One paragraph will be of interest: "The technique of successful radiation of cancer demands: (1) A radiation of the proper quality and quantity. (2) The administration of the lethal dose of this radiation to all the cancer cells at the varying depths at which they exist. (3) The administration of the dose in such a way that, (a) the local resistive power of the normal cells about the tumor is not depressed and, (b) the general resistance of the whole organism is not appreciably lowered."

Factors that have not been mentioned which produce important limitations in the application of treatment are: radiation sickness, leukocytosis (following radiation), stimulation of growth by too small doses of x-ray and necrosis from too much ray.

Concerning radiation sickness Narat[3] says:

> "The application of the roentgen rays to any considerable portion of the body causes a tremendous increase in the destructive metamorphosis of tissue. The effect under consideration is not that of a toxic dose, but that of a single therapeutic application. This calls for increased activity of the aliminative organs. The cases in which this increased destruction of the tissues is likely to produce a harmful effect are those in which there is already a disturbance in elimination of waste products, as in nephritis, congestion of the kidneys, cirrhotic kidneys or those in which the patient suffers from toxemia of cancer, pernicious anemia, leukemia or similar diseases.
>
> "As far as the unfavorable effect of irradiation on the different organs is concerned, there is practically no possibility of any specific after-treatment. The prophylaxis, consisting of a careful protection of the body from the roentgen rays with the exception of the area to be exposed, is the most important factor. It is sometimes extremely difficult to combat the roentgen toxemia. A careful observation of the patients after a roentgen ray treatment proves in many instances that this toxemia is not to be neglected, as it commonly occurs. Irreversible changes in the blood, a real roentgen cachexia, can cause a premature death. Though it is very vital to administer a lethal cancer dose at the first attack, a reckless irradiation is not justified and we would not do the patient a great favor in killing at the same time the cancer and its carrier."

It is well established that the leukocytosis which follows x-ray is an important factor in the cure of cancer. Overdosage causes a more or less permanent reduction of the leukocytes.

On the other hand, it is well held and seems to be borne out by experience that too small doses of rays of tube or radium often tend to stimulation. Let us assume for the sake of argument that this theory has been proved, that we may clear the way, after considering all of the factors involved, for a comprehensive view of the method of treatment that will give the best results.

Our treatment must avoid, first, radiation sickness and severe blood changes; second, too severe local reactions. It must produce the utmost reaction of the supporting tissues. It must be repeated as often as this maximum reaction can be produced.

You will note, if you will recall the dicta of Hirsch, that the conclusions here drawn are practically the same as those quoted from his able article. Still more remarkable is the fact that the technique, as developed empirically by the writer, is almost identical with that mentioned by Pfahler.

What, then, is the point at issue if men experienced in the use of the x-rays develop a nearly uniform technique? Why worry if one group talks of the "one lethal dose", while the other talks of developing an immunity to cancer? Will not the difference be as immaterial as the differ-

ence between the Republican and Democratic parties?

I say: "No". While quinine has always been of value in malaria, it is only since the relation of the life cycle of the plasmodium to the disease has been thoroughly understood that really scientific therapy has been adopted.

Again, true progress can be made in treatment of cancer only when our treatment is based on a knowledge of pathology. It would certainly be fine if all there were to curing cancers were to consider the cell to be killed, its distance, its depth, its type, then take a slide-rule and set it at the point marked "cure". An x-ray machine set in accordance with the adjustment indicated would cure the case. This sounds extreme, but it is what some of our German friends would have us believe. It reminds us of some other German conclusions drawn as the result of pure mathematics.

The problem we are facing is the old one of assisting the human body in the fight against disease. The x-ray stimulates and assists the body in the fight against cancer. It does not kill the cancer.

Just a closing word as to the reason for this paper. It was not written that the experienced men should change their methods, for, as has been shown, men who understand radiology and its limitations develop their technique in accordance with said limitations. It was thought, however, that a paper of this sort might be of assistance to the beginner in radiology or the man who does but a moderate amount of work and who trusts to the directions of the salesman of the machine and the gleanings from the literature for his information as to dosage and technique. Such an one might easily fall into serious error were he to follow the trend of thought as indicated in the literature of the last few years. To such an one I say: Do not take the writings of all the experts too seriously. Follow their practice, not their theories.

To those who observe, cases like the following are familiar: A patient for whom a line of treatment, such as has been mentioned, has been prescribed, looks around a little and decides to go to the x-ray man across the street who gives massive doses. The so-called "massive dose artist", beneath his bold exterior being of a timid and law-avoiding disposition, gives a massive (?) two-thirds erythema dose. The patient is assured that he has had sufficient treatment for six weeks. In six weeks this process is repeated. In ten weeks he returns to the divided massive dose man who finds that the treatment has been just sufficient to fan the flame and the patient is worse off than if no treatment had been given.

Again, a patient has been given sufficient radium to care for the local condition in carcinoma of the cervix. She is receiving the maximum of x-ray, front, back and laterally, that conditions permit. The ultimate outlook is unfavorable, but the patient is comfortable and happy, no odor, no pain, no discharge. Lacking assurance that the patient is cured, the husband sees in the daily papers that Dr. X in a neighboring city has secured one of a new type of x-ray machines giving a voltage that is phenomenal. (Incidentally, there are few such machines in the state, or country, as the case may be). The husband notices that it is *hoped* that this machine will revolutionize the treatment of cancer. The wife, already saturated with treatment, is hurried to the city and given a twelve hour treatment, heavily filtered, with the new wonderful machine. She is taken home deathly sick and for the few remaining weeks of her life suffers radiation sickness and cachexia,—the immediate cause of death being too much ray.

To conclude: the cancer cell is not killed by "one lethal dose" only, but largely by the action on the supporting tissues. The proper dosage is one that stimulates the supporting tissues to the utmost, arouses only a mild negative reaction and decrease of leukocytes, and avoids severe general radiation sickness. This dose should be repeated as often as conditions will permit for a period varying in length in proportion to the size and nature of the lesion to be eradicated.

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EDITORIAL

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ANNUAL MEETING
Rochester, Minnesota
December 3, 4, 5, 6 and 7, 1923

American College of Radiology and Physiotherapy

WHAT is undoubtedly a very significant development in the field of radiology and physiotherapy occurred in Omaha on September 18th, 1923, when the American College of Radiology and Physiotherapy was organized. There has long been great need for a parent organization for the purpose of coordinating the activities of the numerous organizations dealing with these branches of medical science, and for the development of these sciences by affording those members of the medical profession interested therein some place to go for authentic information with respect to physics, technique, etc. That this is the purpose of the present organization will be acknowledged when it is known that the American College of Radiology and Physiotherapy is modeled after the American College of Surgeons and the American College of Physicians.

The organization of the American College of Radiology and Physiotherapy is the logical result of the action taken by the American Medical Association at its latest annual meeting in San Francisco. The following excerpt is taken from the minutes of the A. M. A., as reported in its journal:

> "We feel, however, that the Association should recognize the increasing importance of special medical activities, such as radiology, physiotherapy, and occupational therapy, * * * and we recommend that the American Medical Association recognize the science of radiology as an integral part of medicine and surgery."

Having previously been accorded recognition by the American College of Physicians and the American College of Surgeons, the action thus taken by the American Medical Association completes recognition of the science by the three organizations which constitute the great triumvirate of medical science in the world.

Briefly, the purposes of the American College of Radiology and Physiotherapy, as stated in its constitution, are to elevate the standard of radiology and physiotherapy, to establish a standard of competency and of character for practitioners of radiology and physiotherapy, to provide a method of granting fellowships in the organization, and to educate the public, technicians, and the profession to understand that the practice of radiology and physiotherapy calls for special training and that the physicians elected to fellowship in the College have had such training and are properly qualified to practice radiology and physiotherapy.

It is the purpose of the College to preserve the identity of those organizations and societies already existing in these two phases of medical science and to encourage the formation of others. The College expects to function most happily in acting as a sort of clearing house, to which all other organizations may send delegates at the time of annual sessions and work out constructive policies and programs designed to advance the interest of the science in question and forward the utmost spirit of good will and fellowship among the various organizations upon these subjects, as well as between these organizations and the medical profession as a whole.

The following organizations have already received recognition by the College:

(1) The American Electrotherapeutical Association.
(2) The American Radium Society.
(3) The American Roentgen Ray Society.
(4) The Canadian Radiological Society.
(5) The Radiological Society of North America.
(6) The Central Electrotherapeutic Society.
(7) The Central Illinois Radiological Society.
(8) The Chicago Roentgen Ray Society.
(9) The Detroit Radium and X-Ray Society.
(10) The Iowa State Radiological and Physiotherapy Society.
(11) The Iowa X-Ray Club.
(12) The Missouri Radiological Society.
(13) The Nebraska Society of Radiology and Physiotherapy.
(14) The New England Association for Physical Therapeutics.
(15) The New England Roentgen Ray Society.
(16) The New York Electrotherapeutic Society.
(17) The New York Roentgen Ray Society.
(18) The Pacific Coast Roentgen Ray Society.
(19) The Philadelphia Roentgen Ray Society.
(20) The Roentgen Ray Society of Central Pennsylvania.
(21) The South Dakota Radiological and Physiotherapy Society.
(22) The Utah Society of Radiology and Physiotherapy.
(23) The Western Electrotherapeutic Association.
(24) The Milwaukee X-Ray Club.
(25) The American Physical Society.
(26) American Society of Dental Radiographers.

Similar recognition will be accorded other like organizations upon the presentation of appropriate credentials.

The officers of the College elected at the organizational meeting are:

Samuel Beresford Childs, M. D., Denver.....President
E. A. Merritt, M. D., Washington, D. C..President-Elect
B. B. Grover, M. D., Colorado Springs..First Vice-Pres.
Roy W. Fouts, M. D., Omaha.....Secretary-Treasurer

Officered by such eminent men and having an initial membership running into the hundreds, the success of the American College of Radiology and Physiotherapy is at once assured. That it will rapidly prove its force for good

in the science of medicine along the lines of its organization can hardly be denied.

Every reputable physician or surgeon interested in these branches of medical science will find in the College a mecca of men of like interest, high-minded in their purpose, and zealous in upholding the high ideals and dignity of their profession.

Presidential Address

C. L. Mullins, M. D., Broken Bow, Nebraska

IN OUR AGE peoples everywhere are struggling toward organized effort, trying to combine the forces working along similar lines for the accomplishment of definite purposes.

Commercial enterprises found it advantageous and necessary to organize their business down to the minutest detail and now these separate commercial enterprises working along similar lines are combining and working in harmony and a spirit of cooperation as a matter of economy and efficiency. This, to the writer, seems wise, and he believes that ultimately it will be to the advantage of mankind.

The pioneers in medicine in this country felt the need of organized effort, and through their efforts the first organized medical societies in this country were achieved, and out of these scattered and disconnected medical societies ultimately grew our great American Medical Association. Who can doubt that that Association with its organized ramifications extending to the different counties of the different states has been a benefit to mankind? Has it not furthered the cause of medical education, of scientific medicine, and of public health work in innumerable ways? Today it would be impossible for any one to fully estimate its benefits to the people of this country. In the effort at reorganization of the American Medical Association the writer had an humble but active part, and his sympathy was and is with that effort.

Then, why, with this great organized body of medical men and women is the effort now and here being made to organize a separate, unattached society? The answer is easily found: The large and growing subject of radiology is comparatively new and I believe it a conservative statement that outside of radiography and fluoroscopy but few physicians understand the benefits it may bring to a large class of disease conditions. Comparatively few have followed the development of the x-ray, for instance. Probably few, except the radiologists, know about the modern Coolidge tube and how it enables the user to standardize the dose and to avail himself of the higher voltages, with immense benefits resulting to the victim of disease conditions.

The field of physiotherapy is new to many of you now just engaging in the work, and the modern methods are new to all, due to the great improvement made in recent times in the machinery used by the physiotherapist. That the radiologist and the physiotherapist can and does bring to bear in the treatment of disease conditions measures of very great value, measures not used by the great majority of physicians, you who have had a well observed experience can testify.

It is the province of this society to spread the knowledge of these measures, not only among its own members, but to physicians everywhere. If these methods of treatment are useful, and we believe that they are, the afflicted everywhere should have the benefits of such treatment where indicated. There is no antagonism as between this society and the American Medical Association and its integral parts. For the present, and probably for some years to come, there is and will be need of such special societies working along these special lines.

The time may come, but has not yet arrived, when workers along these lines will find a section in their respective state medical societies. While awaiting this desirable condition idleness is worse than wasteful. There is a useful work to be done. Papers should be read before the regular state and county society meetings by workers in the field of physiotherapy and thus bring forcefully before the general medical man the character of the work being done.

The physician and the surgeon, with the methods pursued now and in the past, have achieved some very wonderful results, but every physician of experience has realized many many disappointments in his endeavors to relieve, while he faithfully followed the beaten path. One of the great retarding forces in man's progress has been his reluctance to get out of the beaten path, his refusal to adopt new measures or methods of procedure.

It is true that all these methods of treating disease are not entirely new, for there have been earnest workers in this field for many years and all honor to these men who by their science, patience and hard work have made the present possible. It is now the duty of you who are working in this field with vastly improved machinery and better methods to carry this knowledge to your fellow physicians. This will be an easier task for you than was that of the pioneers in this field in bringing to you the present satisfactory conditions in physiotherapy and radiology.

In recent years we have seen a deluge of cults and isms spring into being. Some have flourished for a time and then faded away, while others made an appearance. What is the reason, how account for this condition of multiple cults? The main reason seems to be that people patronize them. The question as to why people patronize them seems pertinent.

There is a large class of diseases or disease conditions not benefited, or but little benefited, by methods heretofore used by the physician, and many of these condition are not amenable to surgery. Such patients make the rounds of the physicians and finally many of them fall into the hands of practitioners of one or other of these cults, where they are encouraged to believe that they will be made whole. True, many of them ultimately return to the physician often to his discomfiture. A large number of these diseases and disease conditions can be benefited and many can be cured by the methods of the radiologist and physiotherapist. If the physician is not willing to give of his time and intellect to these sufferers he should not complain if they seek out irregular practitioners. I have heard it said in no friendly spirit that these methods attract a swarm of chronics. This is largely true. Are they not entitled to health, and if that be not possible of attainment, as near health as possible? For such help as you give them they are the most grateful of patients, doubtless because they have suffered for long periods of time. It is a pity, and worse, for the regular practitioner to neglect these perfectly proper and useful measures, for, although in neglecting such means he is cheating himself, the greater loser is the patient.

One of the greatest needs of this work now is a larger literature, text books grounded in science and based upon a well observed experience and complete in the details of technique so that the beginner may have at hand the means to properly direct him in his early efforts. General statements and even elucidation of principles are not sufficient. The technique of application is the most difficult part of the work to learn. The same modality used a little differently often gets results opposite in character. Good journals in this as in other branches of medicine are a necessity and it seems to the writer that good active societies where workers come and exchange ideas and experiences are even more needed than in other fields of medical endeavor. A good

medical society meeting is the best school of instruction. The society is of especial help to the new recruit and he cannot afford to remain on the outside, and his patients can still less afford his maintaining an attitude of aloofness from the society.

In the improvement of the machinery with which we work we have a vital interest. I feel that it should be considered a privilege to work in cooperation with the manufacturer of the devices and machines used towards their improvement. I am confident that all reputable manufacturers will welcome suggestions and be pleased to have your cooperation. In such improvement we have a very real interest. With the manufacturer who puts out a pocket edition and loudly proclaims a cure-all we have nothing in common. Probably some of us have expected too much of the salesmen and the men who install these machines. The most we should expect of these men is a proper installation and the acquisition of a working knowledge of its mechanism. They are not physicians.

I hope it will not be considered remiss to direct the attention of beginners and prospective purchasers of these devices to a point the writer considers important. Beware of pocket editions. The best machine, at whatever initial cost, will prove the cheapest and the most satisfactory. After getting the best the user should take plenty of time to work out the problem at hand before attempting treatment. To allow ones self to be hurried at this stage of his work is to make mistakes, his efforts are likely to be worse than fruitless. The worker must not forget that he has no miracle performing apparatus and that he must still use his knowledge of pathology, diagnosis, etc., as before, and he still has the task of working out just what method of treatment is best suited to the case. We all know that there are many people who still are looking for miracles, and if the beginner allows himself to be hurried by those impatient of results nothing but a miracle will get results for him.

Nothing but close study and hard work will bring a working knowledge of these methods of treatment, just as in other branches of medical treatment. These methods do not offer an easy road to successful treatment, but if one is willing to intelligently study out the problem at hand they do offer a successful method of treatment of many diseases not amenable to the methods with which many of us have had, heretofore, to be content The practitioner who is thinking only of his personal gain, regardless of results, can bring nothing but disrepute upon himself, and his methods hurt the work of the honest worker. He should find no place in this society. A few such individuals on the inside will kill a good society.

If by mischance we find the charlatan in our society he should be summarily cast out. To all honorable physicians the society extends a cordial welcome to its roster of membership. We need them and they need the society. The field is large enough to challenge the best intellects.

With the improvements constantly being made by manufacturers and the increasing knowledge of these methods and their usefulness, with better methods coming into use by the radiologist and physiotherapist the field constantly widens and becomes increasingly interesting. It seems peculiarly fitting that the radiologist and physiotherapist should join forces as they have done in this society. X-ray, radium, actinic ray and the other methods and modalities used by the physiotherapist are often synergistic, often supplementary to each other in the treatment of disease. The user of one modality will, more and more, become the user of all.

To the members of this society I desire to express my sincere appreciation of the honor you conferred upon me and the confidence you reposed in me by electing me your first president. As a token of my appreciation I shall in the future years work for the upbuilding and usefulness of this society, useful alike to the physician and to those who suffer from disease.

The Late John M. Siddall

THE PHENOMENAL success of the late John M. Siddall, editor of the American Magazine, may be summed up in the fact that he realized the value of a constructive program. He laid great emphasis upon the personal appeal and the helpfulness of the cheerful aspects of existence. He hated muckrakers with the most bitter hatred. This point is interesting, too ,for early in his literary career he was himself a muckraker. He helped Ida M. Tarbell collect the material used in her history of the Standard Oil Company—the book chiefly responsible for the avalanche of anti-business and anti-corporation writing characteristic of the magazines of that time. Mr. Siddall's change to the opposite viewpoint was evidently one of evolution. He took hold of the American Magazine when it was of mediocre reputation and made it the leader in its field. His emphasis of the better things in life and his stress upon the attributes of success built up the circulation from 400,000 to approximately 2,000,000. Could any better evidence of his greatness in the editorial field be found?

Success in the field occupied by the late John Siddall is no different in its underlying principles than success in the medical field. The Journal of the American Medical Association has attained a success never before thought possible in medical journalism. For the reason for this success one must point to the man who conceived the idea and carried it through to fruition as editor, Dr. George H. Simmons.

There is no reason why the Journal of Radiology cannot fill its field with equal success. Cooperative, constructive effort has made the Journal what it is today, and if continued will build even greater on the foundation which has already been laid.

Abracadabra

ABRACADABRA! said The Little Lame Prince, and he was off and away to all his heart's desires in a jiffy, traveling on his magic carpet, no, it was a cloak. Have you forgotten him? Well, he did, just the same.

A woman, this summer, lay dying in a London hospital. She knew her fate, that she was soon to die, and she yearned that she might pass out over her own threshold. But she was a Belgian woman and "home" was two hundred miles away, in Brussels— and so she died in London tormented with the homesickness of the stranger who dies in a strange land—Ah, no! Not in this, the Age of Wonders, when even Death sometimes stops to stare a moment, surprised at the doings of the earth children. For, as the *Manchester Guardian Weekly* tells us, by the magic of twentieth century genius this homesick, dying woman reached her home in Brussels within just one hundred minutes from the time the air plane left London. She was taken in an ambulance to the London air station at Croyden, lifted upon the stretcher to a comfortable bed in one of the eleven passenger Napier D. H. 34 planes of the Instone line, which had been converted into a flying ambulance. The 450 horse power engine had been silenced and in absolute comfort the dying patient reached her loved home, there to await the swifter journey in the silent plane that one day calls for each of us to mount and away to the Great Adventure—the adventure that Frohman, awaiting it upon the Lusitania, calmly designated as the most beautiful adventure in life.

We wonder will some later comer to this globe, some day centuries hence, take from a library shelf an old bound

magazine and read on a faded page this account, smiling amusedly to himself at the simple people of that Early Twentieth Century who were so amazed at their, to him, small achievements? Or will he muse on us as now do we upon the genius of the old builders and artists, and wish for his own age a fuller measure of something then lacking in the world?

Physiotherapy Meeting

INTEREST in the subject of physiotherapy among reputable medical practitioners has become so pronounced that H. G. Fischer and Company, of Chicago, has arranged for an extensive program during the month of October. Full details will be found in the announcement which appears over the Fischer Company's signature on the page facing the last reading page.

It will be borne in mind that this meeting is given strictly by medical men for medical men and is open to any reputable member of the profession. Already nearly 500 reservations have been made.

Mr. H. G. Fischer is authority for the statement that those in attendance will be absolutely free from commercial influence or suggestion and that this is merely that company's bit toward the development of a phase of medical science which has been in times past somewhat in disrepute.

The Journal is of the opinion that if the reputable members of the profession will put physiotherapeutic methods under their supervision and work in this field from the inside out rather than the outside in, any stigma now attaching will shortly be removed. That there is much merit in physiotherapy in selected cases is amply proven by the names of

Fifth Italian Congress of Radiology

THIS CONGRESS will be held at Palerno on October 18th to 21st, 1923. Prof. O. M. Corbini and H. E. Senatore Giovanni Gentile are members of the committee under whose auspices the meeting is being planned. Particulars can be obtained from the secretary, Dott. Sigroli Salvatore, Via Alloro, 58 Palerno, Italy.

DEPARTMENT of TECHNIQUE

Rapid Preparation of Developing Solutions

E. G. C. WILLIAMS, M. D.
Danville, Illinois

PREPARED or package developers are very convenient, but are an expensive luxury where tank developing is used. Developing solution can be prepared from bulk chemicals with but very little trouble when the process is simplified and a few time saving accessories are used.

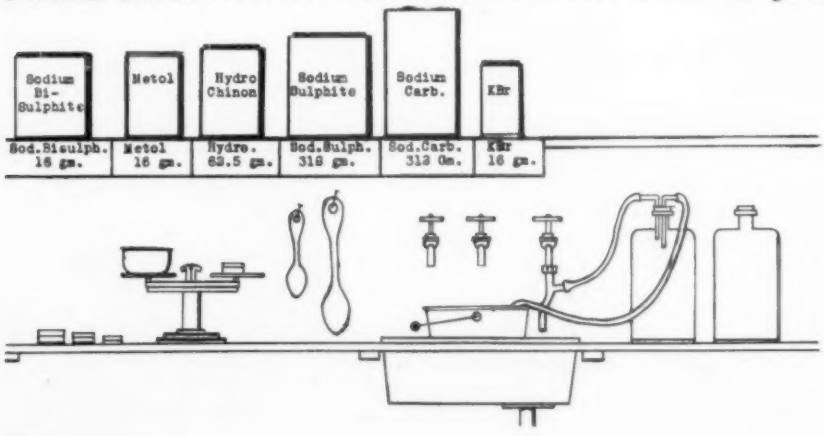
There is no reason for experimenting with different formulas each time the solutions are prepared. The formula we are using now has been in use eight years, is thoroughly satisfactory, and was much less expensive than package developers during the war period, when metol was very costly and hard to find.

The quantity made each time is an important factor. Two gallon lots have been found to be most conveniently prepared. Five gallon lots are difficult to make and handle on account of the weight of jars and danger of incomplete solution of the chemicals.

The following formula for two gallons of developer is given to illustrate method of preparation. Any formula can be arranged for this system by changing weights or order of solution.

The illustration diagrams the arrangement of shelf, table and sink for convenient preparation of solution.

Water	2 gallons	9	litres
Sodium Bisulphite	4 drams	16	grams
Metol	4 drams	16	grams
Hydrochinon	2 ounces	62.5	grams
Sodium Sulphite	10 ounces	312	grams
Sodium Carbonate	10 ounces	312	grams
Potassium Bromide	4 drams	16	grams



The bulk chemicals are arranged on the shelf in order of their use and a label with the name of the chemical and the amount to be used is attached to the edge of the shelf under each can. A simple balance scale with a 15 cm. porcelain lined pan and counter weight make most convenient weighing equipment. The counter weight for the pan and the 16, 62.5 and 312 gram weights are made of tin ointment boxes containing sufficient lead scraps or dental film backs to make the proper weights. These weights are easily made and save hunting out numerous small weights for each change. Enameled cooking spoons are used in weighing and stirring.

Fill the two gallon bucket two-thirds full of hot water. Add chemicals in order, being sure each is dissolved before adding the next. When all are dissolved, fill the bucket to the two gallon mark. Solution may be poured directly into the tank or stored in gallon bottles.

An ejector or filter pump facilitates filling bottles and emptying the developing and fixing tank when changing solution. A large bore aluminum pump is best suited to this work, as the brass pumps are soon ruined by the chemicals.

The equipment for this work is inexpensive. At current prices of photographer's chemicals, solution can be made for about forty cents a gallon.

CASE REPORTS

X-Ray Demonstration of Four Months Pregnancy

C. J. JOHANNESSON, M. D.
Walla Walla, Wn.

THE CIRCUMSTANCES in connection with this case are as follows: A woman, aged 22, was referred to me for diagnosis, July 9, 1923. Pregnancy was suspected, but the patient denied any such possibility. External examination of the abdomen revealed only a slight enlargement of the uterus, somewhat palpable upon deep manipulation, otherwise there were no abdominal nor breast symptoms. Menstruation had begun at 14 years of age and had always been regular and normal. The last menstruation was given as April 20, 1923. There was no history of quickening, nausea or vomiting; no edema or leukorrhea, nor any history of hereditary disease. Patient weighed 153 pounds and was a well nourished, healthy, unmarried woman.

The roentgenogram, as here reproduced, showed a clearly outlined flexed fetus in almost a true lateral position. The outline of the skull was distinct and the ossification centers of the spine and long bones of the extremities were visible.

The roentgenogram soon convinced the patient of the positive condition of pregnancy. A few days later I learned that she had induced abortion herself. It was, therefore, impossible to confirm the age of the fetus, but after its removal it was estimated by several physicians to be not more than four months old. Weight was 64 grams and length from top of head to coccygeal region measured 116 mm.

In a recent article by Drs. Stein and Arens of Chicago (Jour. A.M.A., 81:5, July 27, 1923) I find the statement that they have been unable to demonstrate the fetus with regularity before five months and that they are of the conclusion that not until the beginning of the last trimester can the fetus be regularly demonstrated so as to be helpful and convincing from a diagnostic standpoint. In the same article is a reference to Kuegle, who had demonstrated a three months' fetus by the x-ray, however, nothing could be seen in the reproduction.

It is my opinion, in view of experience, that by extremely careful and painstaking technique one can be assured of clear roentgenograms demonstrating a fetus as early as four months. At the present time I have patients under observation with the expectation of securing roentgenograms of fetuses at a much earlier date. For example, a woman, aged 31, was referred to me a few days ago for a differential diagnosis of pregnancy and ovarian cyst. The roentgenogram demonstrated clearly the size and outline of the uterus, approximately the size of a five to six months pregnancy, but no fetal skeleton could be seen, although several roentgenograms were taken. The surgeon was notified that no pregnancy was present corresponding to the size of the uterus and that no ovarian cyst was present, but that the tumor was an enlargement of the uterus (non-pregnant). Thorough investigation revealed that the patient had a "hydatid mole."

In comparing the excellent illustrations by Drs. Stein and Arens in the above mentioned article with the reductions from my film there is found a considerable difference in the size of the fetuses illustrated at six months in that article with the fetus I have demonstrated here. This comparison alone will prove that the roentgenogram I am presenting herewith shows a fetus at a much earlier date than six months.

ABSTRACTS and REVIEWS

Surgery and Roentgenology. Charles F. Nassau, M. D., Therapeutic Gazette, 47:465-468, July, 1923.

THIS paper, by Dr. Nassau, who is an assistant professor of surgery in the Jefferson Medical College and who is also surgeon to the Jefferson and Frankford Hospitals, Philadelphia, advocates hearty cooperation between the surgeon and the roentgenologist. There are, it is true, times when the x-ray fails to aid the surgeon as he had hoped it might but it is equally true that there are times when surgery is blind without the aid of the x-ray and therefore the surgeon cannot afford to ignore that aid. Not every roentgenologist is equally skilled as an interpreter and this fact will be found to explain many inconsistencies between x-ray findings and operative findings. This should militate against unskilled roentgenologists but the fact is that it militates against roentgenology itself in the minds of many surgeons.

In malignancies the author advises operation whenever possible. Postoperative and palliative treatment is heartily recommended. However, the author advises against diagnosis by x-ray alone and believes that no roentgenologist should undertake treatment of malignancy unless he and the surgeon have arrived at a joint understanding regarding the case. "There

are circumstances, of course, under which either may work alone, but in the majority of cases the patient benefits by their cooperation.

High Voltage Roentgen Ray Therapy; Conclusions Drawn from the Treatment of Three Hundred Cases. Sherwood Moore, M. D., J. A. M. A. 81:269-274, July 28, 1923.

THE author's conclusions are: "(1) All methods of treatment of malignant disease are in need of critical examination. (2) Such treatment needs better coordination between surgical and radiotherapeutic measures and a better understanding between surgeons and radiotherapists. (3) Patients in the malignant ages should be more closely studied, both in regard to the possible existence of neoplasm and in regard to its extent. (4) Patients with widespread extension and metastases should have less surgery and more radiotherapy. (5) More and closer clinical observation and a better follow-up system is a most urgent need in the management of cancer patients. At present there is a disproportion between the time and energy expended on laboratory and clinical studies of malignant disease, respectively. (6) Every effort should be made to place the treatment of malignant disease on the more rational basis of using the natural resistance of the body to combat the disease. The analogy of the treatment of pulmonary tuberculosis presents itself."

Physiotherapy Technic: A Manual of Applied Physics. By C. M. Sampson, M. D., formerly of the Physiotherapy Service, Walter Reed, U. S. Army General Hospital No. 9, Lakewood N. J., etc., etc. Pp. 443, illus. 85, size 9¼ by 6¼ in. Silk cloth binding. 1923. Price $6.50. C. V. Mosby Co., St. Louis, Mo.

THIS author needs no introduction to those familiar with the literature upon this subject. The book is an attempt to put before the medical profession the truths of physiotherapy as the writer has demonstrated them throughout a long experience in a clinic having a trained personnel of 110 operators giving 2300 treatments daily. The author warns against overenthusiasm but nevertheless believes that the field for the proper administration of these remedies is so large that he will not live to see its boundaries completed.

Striking and conclusive data are submitted. The author says: "Practically every step in the technique given in this book is based upon research both in the laboratory and clinic and the results have been checked both by myself and many others who, probably, could not be accused of being prejudiced in favor of the methods. Not a single technique which failed to stand such checking has been included."

The publishers say: "A simple, practical and proven explanation both of the physics involved in the making and application of the physical remedies by a man that positively knows his book upon this subject. The Sanskrit of electricity has been translated into plain English for the physician."

The proper blending of physical remedies is emphasized throughout; also it is said, "Best results can only be secured by taking advantage of every bit of help it is possible to get from the surgeon, internist and laboratory man—we need their help as much as they need ours—and they will not aid us nor allow us to aid them if we keep them antagonistic."

Aside from its scientific value the book is written in a vigorous, entertaining style and in addition to the usual directions for technique is packed full of practical suggestions garnered during the writer's practice.

The chapter headings are 1. The Absolute Necessity for Proper Technique; 2. Examination of Patient; 3. Classification of Physical Remedies; 4. Forms of Heat; 5. High Frequency—General Considerations; 6. Diathermia; 7. Autocondensation (Direct and Modified Diathermia); 8. Nonvacuum Electrode (Indirect Diathermia); 9. Static Modalities; 10. Actinotherapy; 11. X-Ray Therapy in Nonmalignant Conditions; 12. Ultraviolet and X-Ray as Physiologic Complements in Therapeusis; 13. Treatment of X-Ray Burn; 14. Galvanic and Faradic Currents; 15. Sinusoidal Current; 16. Comparison of Interrupted Galvanic and the Galvanic Sinusoidal Currents; 17. Peripheral Nerve Wounds; 18. Massage; 19. Hydrotherapy; 20. Arthritis; 21. Locomotor Ataxia; 22. Pyorrhea Alveolaris; 23. Genito-urinary Conditions; 24. Hay Fever; 25. Trouble Shooting; 26. Adapting Physiotherapy to Private Practice of General Hospitals; 27. A Few General Considerations; 28. Definitions.

Late Lesions of the Larynx Following Irradiation. Otto Juengling, M. D., Strahlentherapie, 15; No. 1, 1923.

THE author distinguishes three reactions following irradiation of the larnyx with deep doses:

1. *The Early Reaction:* With the technique of 100 per cent USD applied to the lesion through two converging fields an early reaction with edema was expected, similar to that observed in irradiation of submaxillary and submental regions. The tracheotomy apparatus was kept ready for use. But no edema occurred. There was enlargement of the submaxillary and submental glands and some increased salivation which soon gave way to marked dryness and hoarseness. The buccal and pharyngeal mucous membrane showed no changes. The condition lasted only a few days.

2. *The True Roentgen-Ray Reaction:* The author's own cases (13) showed only some skin erythema with but a few whitish patches in the laryngeal mucous membrane. In only one case was there any difficulty in swallowing and this was transient. Marshick, however, had one case with marked edema of the larynx which required tracheotomy. The condition soon improves.

3. *The Late Lesions:* The author calls particular attention to the late changes which follow even when the skin is entirely unharmed. The changes are those of atrophic conditions setting in in the finer musculature, perichondritis, and cartilage necrosis which does not show alarming symptoms within the first four weeks. Five illustrative cases are cited by the author. All five are similar in their history.

One case was that of an irradiation for sycosis occurring in one large field on either side, extending from the eyes to the clavicle. One skin unit dose was delivered to each side. There was no skin burn. At first there was marked dryness of the throat with hoarseness, with transient paralysis of one vocal cord from which patient recovered. After eight months patient complained of sore throat, hoarseness and stridor. Examination showed loss of flesh, reddened and swollen epiglottis, gray patches on the left side, on the left aryteno-epiglottidean fold, and on the left ventricular rim. The right arytenoid cartilage was thickened, with slight exudate. No diptheria bacilli were found. Increasing swelling of the epiglottis required tracheotomy and because of obstruction of the esophagus artificial administration of food was necessary. A few days later a piece of cartilage was coughed up. Roentgen examination of the larynx revealed irregularity of contours. Marked swelling of neck followed which necessitated a gastrostomy. One month later patient died. Section showed the following important findings: (1) Degenerated musculature of the floor of the mouth. (2) Necrotic cavities in the laryngeal carti-

lages. The aryteno-epiglottidean folds were destroyed. The upper border of the epiglotis was slightly discolored and brittle. (3) The pharyngeal vestibule, the ventricles and their rims were changed into a necrotic, greenish-black, ill-smelling mass. Also the vocal cords were discolored and brittle, and could barely be identified. The thyroid cartilage was not affected. Only at its lower edge a pea sized spot of brittle consistency could be found. The arytenoid cartilages were destroyed, while the cricoid cartilages were not affected. (4) Microscopic examination showed a decrease of capillaries, thickening and obliteration of blood vessel walls, generalized increased connective tissue. There was also fatty degeneration of the neck musculature.

The author considers injury to the blood vessels the most important cause of the condition.

In a similar case which was treated with deep roentgen-ray therapy for papilloma of the larynx, there were good therapeutic results for the first two months, when the late injuries began to manifest themselves. Tracheotomy and gastrostomy were necessitated. Death followed and section showed findings similar to those of the case above. It is important to note that the original pathological condition had been cured.

The author arrives at the following conclusions: (1) Under no circumstances, should a carcinoma dose or a 100 to 120 per cent skin unit dose be delivered to the larynx. (2) An operable carcinoma of the larynx should not be treated with x-rays. (3) An irradiated carcinoma of the larynx

should not be subjected to surgery.

The author noted that in most cases the x-ray ulcer was located on one side or the other, showing that one part received more radiation than another. He, therefore, advised the use of paraffin upbuilding for homogeneous radiation. Holfelder uses a specially prepared paraffin collar for this purpose. At first, attempts at a 90 per cent dose should be made. In larynx papilloma only 80 per cent should be used. Should not be repeated unless especially indicated.

A. M. PFEFFER, M. D.

X-Ray and Radium Treatment of Goiter. G. W. Grier, M. D., Atlantic M. J. 26:516, May 19, 1923.

THIS paper was read in the Symposium on Goiter before the Section on Surgery of the Medical Society of the State of Pennsylvania, October 4, 1922.

The radiologist intending to treat goiter must first recognize the type of lesion he is to deal with. The prime indication for radiation treatment of goiter is the presence of hyperthyroidism, consequently the best classification is one based on the presence or absence of hyperthyroidism, as follows:

Hyperthyroids:
- Adolescents
- Hyperthyroids without goiter
- Hyperthyroids on basis of old simple goiter
- Exophthalmic goiter
- Introthoracic goiter

Without Hyperthyroidism:
- Adolescents
- Simple goiter
- Colloid goiter
- Cystic goiter
- Introthoracic goiter
- Malignant thyroids

Having determined the presence of hyperthyroidism by clinical evidence and the metabolism test, we next attempt to classify the hyperthyroid cases. Cases not showing hyperthyroidsm should not be radiated, unless malignant, when they may be so treated in conjunction with surgery.

In adolescent goiter, where hyperthyroidism exists, a small amount of x-ray treatment, with proper hygiene will bring about a speedy return to normal.

In cases of hyperthyroidism without goiter, careful consideration must be given to causes outside of the thyroid which may produce hyperthyroidism. After an exciting cause has been found and removed, should the case not then return to normal, radiation is preferred to surgery.

In exophthalmic goiter, the individual requirements need to be considered. If there is acute thyrotoxicosis, rest in bed and medical treatment for the time being is the proper course. The average case may be treated with radiation, usually with good results. If there are pressure symptoms from the growth, surgery is to be preferred to radiotherapy. Surgery is also preferable for patients who, for economic reasons, are not able to carry out the medical or radiation treatment over a long period of time, or whose home conditions or intelligence make the proper hygienic treatment impractical. Also, if the patients are pessimistic or have preconceived ideas that only surgical treatment is effective, they should be operated at once.

In hyperthyroidism on the basis of a simple goiter, the hyperthyroidism can be controlled by radiation, but since it will have little effect on the tumor, operation is usually preferable.

Introthoracic goiter, with hyperthyroidism, can be controlled, but since the radiation usually has little effect on the growth, operation is better when it can be safely done.

The rationale of the treatment of goiter by radiotherapy depends on the inhibition or abolition of the secretory function of the gland, or even the complete destruction of the secreting cells. Obviously, therefore, the treatment is only indicated when there is an excessive secretion, i. e., a hyperthyroidism. If there is no hyperthyroidism, radiation is contra-indicated. Radiation must be supplemented by a careful regulation of the patient's hygiene, especially as regards rest. They must have eight to ten hours sleep each day, with plenty of fresh air and nourishing food. Stimulating drinks are forbidden and meat is only occasionally allowed.

X-ray is used on office cases for purposes of convenience only, the action of the two agents being regarded as identical. Radium is used on patients confined to bed.

Treatment is not to be continued indefinitely if there is no improvement. The average case requires about six months for regression to the stage where treatment can be discontinued.

W. WARNER WATKINS, M. D.

Lung Abscess. George J. Heuer, M. D., Minnesota Med. 6:279, May, 1923.

FROM the standpoint of etiology, tonsillectomy is at present the most common cause of lung abscess. In every large and small series of *recently* reported cases it stands out as the foremost cause of lung abscess and the number of reported cases is rather alarming. After studying the various views expressed in literature, certain facts stand out:

(1) Lung abscess follows tonsillectomy and the operation is responsible for the disease. (2) The vast proportion of lung abscesses follow tonsillectomy done under general anesthesia. In 76 reported cases of one series, 74 had had a general anesthetic. (3) Abscess does follow tonsillectomy done under local anesthesia but the proportion of cases is small. (4) Lung abscess follows tonsillectomy even when, according to the author's statement, the operation is done with every possible precaution.

Aspiration of foreign bodies is the cause of a fairly large number of abscesses though not nearly so great as the preceding cause, probably ten per cent of the reported cases being due to foreign bodies.

Lung abscesses also occur secondary to infectious processes elsewhere, such as liver abscess, appendicitis with peritonitis, mastoiditis, empema,

etc. In the author's series of 62 cases, 7 cases followed acute abdominal conditions, 2 acute mastoiditis, 3 septicemia following acute osteomyelitis, and 15 were associated with empema.

Lung abscess may follow other surgical operations than tonsillectomy; in the author's series, 14 of 62 lung abscesses followed such operations.

Lung abscess secondary to pneumonia is given in all earlier statistics as the most frequent form, and this was true in the author's series.

Many cases of lung abscess are multiple, though seldom so recognized during life. In diagnosis, although we still rely upon an accurate history, a careful physical examination, on cough and character of sputum, we must admit the enormous value of the x-ray in detecting and localizing the abscess.

Treatment is discussed under the headings of (1) spontaneous recovery; (2) artificial pneumothorax; (3) surgical drainage; (4) thoracoplasty; (5) bronchoscopic irrigation; (6) lobectomy.

"Our experience simply demonstrates that lung abscess as seen in a general service occurs as a complication of many conditions and presents itself in a variety of forms. It may be overshadowed by other conditions, and, as in fourteen of our cases, be discovered in the autopsy room, and present itself in multiple form quite unfavorable from the standpoint of surgical treatment. It may be recognizable but occur in multiple form so as to defeat our surgical efforts, as in six of our cases."

Serious efforts should be made at the present time to prevent lung abscess, by measures which the etiology of the disease would indicate, and to prevent the development of chronic abscess by early active treatment of the acute abscess.

W. WARNER WATKINS, M. D.

The Fluoroscope in Modern Cardiology. Louis F. Bishop, M.D., Sc. D., F.A.C.P., New York State J. Med. 23:205, May 1923.

THERE is nothing that can take the place of fluoroscopy as a short cut in the diagnosis of cardiac disease. It puts one immediately on the track of the disorder but later it must be combined with every other method of examination as a means of determining the nature of the trouble. In the severer types of heart trouble that have led to important changes, the picture often tells the entire story. But its greatest value is in the detection of minor impairments where the stethoscope has entirely failed.

In the examination of a large number of patients to determine which are needful of detailed cardiological study fluoroscopy is a particularly valuable procedure.

Changes in the position and size of the heart can easily be noted and usually direct evidence can be obtained as to the cause of these changes.

W. WARNER WATKINS, M. D.

Rontgen Ray as an Adjuvant in Treatment in Advanced Cases of Carcinoma of the Stomach. Chas. R. Robins, M. D., Virginia M. Monthly, 49:331, April 1923.

WHILE this paper is based on one case only, it is presented because the case was so thoroughly studied. Other cases have been handled by combined surgery and x-ray treatment with very gratifying results in relief of symptoms.

X-ray showed a constant defect in the stomach, and it was thought a radical operation might be done. Exploration showed a hard indurated tumor involving the stomach just proximal to the pylorus; it was freely movable but seemed to involve the lumen of the stomach enough to almost occlude it; metastases to the glands were found, and a posterior-gastro-enterostomy was rone for temporary relief. As soon as patient could be moved, x-ray treatment was administered by Dr. Fred M. Hodges. From the first treatment the condition began to improve, and continued to improve so far as the stomach symptoms were concerned, however, the patient died, fifteen months later, of carcinoma of the liver.

W. WARNER WATKINS, M. D.

Congenital Pyloric Stenosis in Adults. Lothar Heidenhain, M. D. and George B. Gruber, M. D., Deutsch. Ztschr. f. Chir. 179:330-387, May 1923.

PATIENTS complain of intense pain in the epigastrium coming on at various intervals after meals. Some are very sick. Often there is some occult blood in the stools. These cases are often diagnosed as ulcer in the pyloroduodenal region. On operation neither ulceration, nor scarring can be found, yet the pyloric opening is markedly narrowed so that only the tip of the little finger can pass into it. The gastro-enterostomy successfully obviates the symptoms. Such cases are usually considered to have had either an open, unrecognizable or a healed ulcer.

In a number of resected portions of the pylorus the authors observed an anomalous narrowing by ring formation due to muscular hypertrophy, the pathological condition being similar to that observed in infants.

The authors are of the opinion that in a large number of cases the complaint of gastric difficulties is due to a stenosis of the pyloric ring produced by a hypertrophic condition of the musculature. Moreover, ulceration of the pyloroduodenal region is often secondary to this hypertrophic stenosis. This condition of hypertrophic stenosis is, furthermore, congenital and may or may not have given symptoms in infancy.

The authors quote many authorities who report an apparent cure in children who had received medical treatment for a hypertrophic pyloric stenosis but in whom a laparatomy, performed later for some other cause, revealed persisting stenosis.

They also maintain that, in absence of any surgical intervention, the pathological condition in infants is eventually compensated by a generalized hypertrophy of the gastric musculature. This hypertrophy is sufficient to permit normal function of the stomach unless, due to some cause, there sets in either a weakening of the gastric musculature or an increased spasm of the pyloric rgion.

In a large number of cases cited by the author there were some in which operation revealed ulcerations, and many in which no trace of ulcer could be discovered. They all presented a narrowed pyloric ring which would not permit the passage of the tip of the little finger. Most of them presented a flabby stomach wall with some dilation. Roentgen-ray findings revealed an atonic stomach, mostly down in the pelvis, with some smaller or larged residue after six hours.

Accompanying microphotographs of sections of the pyloric region, where resected, show normal mucosa, but increased musculature, chiefly on one side. In one section one can see the muscular coat on one side four times as thick as the muscular coat on the other side of the ring.

A number of photographs of stomachs laid open show the thickening of the pyloric musculature in either one side or the other.

A. M. PFEFFER, M. D.

Roentgen-Ray Diagnosis of Diverticulum of the Duodenum, With Special Consideration of Etiology. W. Baensch, M. D., Fortschr. a. d. Geb. d. Roentgenstrahlen. 30: 322-326, 1923.

THE diverticulum is visualized as an opaque spot (at times accompanied by layer formation and gas bubble) near the duodenum, which may often persist for days. It is visualized by compression of the duodenal jejunal flexure. The true duodenal diverticulum, whose walls are

histologically identical in structure with the rest of the intestinal tract, and which is usually congenital, is most frequently found in the descending and inferior portion, rarely in the ascending or upper portion of the duodenum. Its walls may show peristaltic movement. The author describes a case of diverticulum of the superior portion, diagnosed by the roentgen ray examination and confirmed by section.

It should be borne in mind that if the duodenal diverticulum is located in the concave side of the pars inferior, it may be unfilled in the standing position and may not be visualized.

Aside from the true diverticulum are such produced by a herniation of mucous membrane only without covering of the rest of the coats. Such diverticula appear quite frequently and are roentgenologically of small dimensions. They may be found in any portion of the duodenum. Also through dilation of the openings of the ductus choledochus and Wirsung's duct a type of diverticulum may arise. These diverticula are found in the descending portion and show at their blind end a division at the meeting points of the two ducts.

In the differential diagnosis must be considered possible perforations with adhesions, perforation of a gallbladder empyema, niche of the lesser curvature, and pocket formation of duodenal ulcer origin.

A. M. PFEFFER, M. D.

Value and Limitation of the X-Ray in the Diagnosis of Chronic Appendicitis. Lester Levyn, M. D., F.A.C.P., New York M. J. & M. Rec. 117:688, June 6, 1923.

THIS author's conclusions from his observations in chronic appendicitis, are:

Many symptoms are common to numerous abdominal conditions; the x-ray is of value in differential diagnosis of these, and almost always is capable of eliminating certain organs and detecting the offender.

Obscure symptomatology may be due to unsuspected appendiceal disease discovered in the course of an examination of the gastro-intestinal tract.

Tenderness over the McBurney point does not necessarily indicate appendicitis, because the appendix may be remote from this site. Its location can be determined by the fluoroscope.

An appendix that retains barium after the cecum has emptied is not necessarily diseased.

Size and position in the absence of certain signs are of scarcely any significance.

Left sided appendix can be demonstrated by no other method.

The roentgen evidence of involvement of the appendix is as follows: 1. A visualized appendix that is definitely sensitive to fluoroscopic palpation. 2. Inability to visualize the organ because of obliteration of its lumen, together with a cecum tender to pressure. 3. Persistent kinking or constrictions. 4. Concretions. 5. Adhesions. 6. Reflex pylorospasm.

W. WARNER WATKINS, M. D.

Pyelography: Common Diagnostic Errors. Miley B. Wesson, M. D., California State J. Med. 21:193, May 1923.

UROLOGY has become a very attractive specialty, because of the accuracy of diagnosis. In this specialty, pyelography is one of our most important diagnostic procedures but can not be depended upon alone, as it is very easy to misinterpret the pyelograms.

A large proportion of the pyelograms and ureterograms are valueless because of (1) incomplete filling of the pelvis and (2) splinting effect of the catheters in the ureters. In order to avoid pain the catheter should be in or nearly in the pelvis when the injection is made, then it should be withdrawn six inches and the ureter injected. The ideal method is to inject under fluoroscopic vision.

In searching for stones, the first radiographs should be plain films of the genito-urinary tract, which in 90 per cent of the cases, will show the kidney outline, and stones if present. Pyelograms and ureterograms are necessary to localize doubtful shadows.

Ureteral strictures and dilatations are important, but should not be diagnosed, unless they are persistent on a number of films. Peristaltic constriction waves are easily demonstrated under the fluoroscope or with a series of radiographs. Reports of strictures based on single exposures are justly to be regarded with skepticism.

The most confusing pyelograms are those of early hydronephrosis, (through failure to recognize as normal the bizarre shaped pelves). All pelves with a capacity between 3 and 12 c.c. whose secondary calices terminate in delicate cup-like processes are to be regarded as normal. The earliest evidence of hydronephrosis is a flattening and broadening of the delicate minor calices; next, a broadening of the base of the calices, and in increase in size of the true pelvis; finally, all variations up to a rounded sac.

Renal motility causes an intermittent distention of the pelvis with colic, but the obstruction is of such short duration as never to cause dilatation. Horizontal and vertical firms are of value in determining renal motility. There is normally a certain amount of motility and often when the radiograph is taken with the catheter in situ this acts as a splint and the heavy filled pelvis and funnel-like upper end of the ureter may sag down and make a much sharper kink than is really present under usual conditions.

In early renal tuberculosis, pyelograms are of great value, as they show erosions of one or more minor calices, with or without dilatation of the major calyx. In advanced cases, plain pictures showing the characteristic calcium deposits are more important than pyelograms.

In tumors, early diagnosis is of prime importance, and pyelography is therefore essential. The changes to be looked for are (1) Elongation of the pelvis; (2) distention or retraction of one or more calices or the whole pelvis; (3) filling defects of the pelvis from invasion of its lumen; (4) rotation and abnormal position of an otherwise normal pelvis; (5) enlarged kidney shadow and (6) overlapping of vertebra by the ureter; these changes are not pathognomonic, and all the facts elicited from a careful history and complete examination are necessary.

The amateur with a cystoscope is a dangerous person in medicine, the untoward results being due to (1) passage of a cystoscope in a very old debilitated person; (2) ureteral spasms and complete suppression from trauma; (3) use of toxic fluids; (4) overinjection.

A large series of excellent illustrations made in the Departments of Roentgenology of the Stanford University Hospital, University of California Hospital, Letterman General Hospital, U. S. Marine Hospital and U. S. Naval Hospital, all of San Francisco, accompanied the article.

W. WARNER WATKINS, M. D.

The Sensitiveness of the Adrenal Bodies to X-Rays, and Means to Guard Against Injury to These Bodies in Deep X-Ray Therapy. Drs. Holfelder and Peiper, Strahlentherapie, 15: No. 1, January 17, 1923.

THIS investigation was begun at the Frankfort University Clinic upon the occasion of two cases showing temporary symptoms of Addison's disease after irradiation of the upper abdomen.

The authors review the interesting reports in the literature, which, however, are not altogether reliable on account of the lack of exact scientific procedure. Before giving their findings, so as to afford standards of

comparison, they discuss at some length the normal microscopic anatomy of the adrenals in the guinea pig, the animals used for experimentation.

The guinea pigs were bound to boards, with backs toward the tube, and were covered with leaded rubber, except one transverse strip 3 cm. wide in the region of the adrenals. The adrenals were determined to be at a depth of 1.5 to 2 cm. An H. S. H. tube, 42 cm. spark gap, 2 ma., 0.5 mm. zink filter was used. In all but one animal the skin target distance was 30 cm. Various doses were applied to 15 animals. Some of the animals were killed after some time, and some died of extreme weakness. Autopsies and microscopic sections were studied. The authors give a detailed account of the pathological findings, and a number of microphotographs illustrating the changes which occurred.

The following conclusions are arrived at by the authors: The pathological changes in the radiated adrenals do not run parallel with the quantity of radiation. The clinical condition was not in agreement with the histological changes One animal which received an 180 per cent effectual dose and ran the worst clinical course, gave absolutely normal histological findings. Another animal which received a 90 per cent effectual dose died on the twenty-first day, and showed an extremely lipoid poor adrenal body, which finding is often spoken of as adrenal scurvy. There were three cases receiving 60 per cent, 75 per cent and 120 per cent respectively, which showed equally marked destructive changes. There were, on the other hand, cases which received 60 per cent and 100 per cent with but slight changes. The conclusion is, therefore, that the sensitiveness of the adrenals to irradiation is markedly variable. This explains the variety of reports in some of which small doses exerted marked influence, and in others large doses had no effect.

Since in some individuals the adrenals may have a particular sensitiveness to irradiation the adrenal bodies should be excluded from the field of irradiation. Slight changes in the direction of the beam will be sufficient to avoid the adrenals.

A. M. PFEFFER, M. D.

Adrenalin Content in the Adrenals After Irradiation by X-Rays. Drs. David and Hirsch. Klin. Wchnschr. 2:790, April 1923.

THERE have been various reports concerning the action of roentgen rays on the adrenal bodies. One group of observers found definite changes in the blood pressure, another group found changes in the sugar metabolism following radiation. Still another group could find no definite results.

The authors studied the adrenalin contents in guinea pigs and rabbits, and dogs, 40 in all. In each one, one adrenal body was isolated and exposed to the rays, which were of a definite quantity, while the other adrenal was thoroughly protected from the rays. The application of rays varied from one skin dose to one-fourth skin dose. Conclusions by the authors: (1) The adrenal system is influenced by radiation with x-rays. (2) A distinct lessening of function is obtained by a radiation of one skin dose. (3) An increased function is obtained by radiation with one-fourth skin dose.

A. M. PFEFFER, M. D.

Radium in Carcinoma of the Breast: A Necessary Preoperative Routine. George Stuart Willis, M. D., New York M. J. & M. Rec. 117:454, April, 1923.

IN more than 60 per cent of the cases the axillary nodes are palpable at the time the patient comes for operation, and according to Ewing only one cure in twenty-five may be expected from operation in this type of case. Surgical statistics show that about 35 per cent of patients operated for carcinoma of the breast are alive at the end of three years and twenty-five per cent at the end of five years. Handley states that recurrences are mainly of the intercostal and supraclavicular types. He states further that radium should never be omitted in the treatment of supraclavicular metastases. Radium postoperatively and in recurrences has given results which justify its use. The most successful results will be obtained when radium as a routine measure is used postoperatively.

In the early technique of radium application, this was entirely superficial, the patient frequently receiving as much as 35,000 mg. hours in one week; many of these patients had a radium toxemia. The introduction of radium needles revolutionized the technique. The author now uses a special transfixion needle 15 cm. long containing 33.33 mg. of radium if necessary, these are reinforced with smaller needles. After thorough radiation of all parts of the tumor by these needles, a violent reaction occurs, which subsides in seven or eight weeks, and surgical treatment is not to be advised until this stage is reached. Within six weeks of the operation, a complete raying of the scar and surrounding lymphatic area is given.

The author gives the history of seven cases in detail.

W. WARNER WATKINS, M. D.

Special Features of Radium Therapy in Gynecology. Arthur H. Curtis, M.D., Wisconsin M. J. 21:498, April, 1923.

IN hemorrhage of the menopause, the author employs 10 or 12 hrs. with 100 mg. m. thinly screened, held by a Michel clip at the external os. Two or three applicators in tandem throughout the uterine cavity are better than a single applicator.

The so-called myopathic hemorrhage of younger women is best managed by smaller doses (e. g., 100 mg. for four or five hours); this may be repeated after four or five months, if necessary.

In fibroids in young women, radium is ill-advised unless operation is contra-indicated; it is likewise contra-indicated in abdominal pain, in presence of active pelvic infection, in rapidly growing tumors, and where the diagnosis is uncertain.

In only one type of pelvic infection is radium indicated and that is chronic leukorrhea. Smaller doses are preferred.

In cancer, radium is used without operation in practically all cases except that of the fundus. Two treatments are the rule, as it has been found that additional radiation does harm rather than good. Applications are made in the canal and by burying needles around the periphery of the growth. The first treatment is 3500 mc., the equivalent of 100 mg. for 35 hours. The second treatment is not given for two months, when about two-thirds of the first dose is given.

After the second treatment, there may be a hard induration resembling cancer, but this should not be treated, it is the result of the radium and further applications would be dangerous.

W. WARNER WATKINS, M. D.

Inoperable Carcinoma of the Cervix: A Report of Three Cases in Which Radiatherapy Arrested the Disease. S. D. Neeley, M. D., J. Oklahoma M. A. 16:113, May 1923.

SECONDARY conditions such as tuberculosis, diabetes, nephritis, etc., render operation almost certainly fatal. Crossen says the operable cases are those in which the malignant disease is still confined to the tissues that admit of complete removal, and where the patient is in condition to stand the radical operation. Cases inoperable because of the patient's condition or disease have their only hope of cure

or comfortable lease of life in radiotherapy.

Case I: This was a carcinoma involving the left parametrium, with a mass the size of an orange in the broad ligament, the cervix had a cauliflower growth which obliterated the canal, and extended down on the vaginal surface. This case was given 2400 mg. hrs. of radium inside and outside the cervix, and the skin dose of hard, filtered x-rays was given twice. Lesion has entirely disappeared. Patient is now doing her household work and feeling well.

Case II: This was a large fungating growth obliterating the cervix, with a mass as large as a grapefruit in the left pelvis. Patient was given 2500 mg. hrs. intracervically and against the cervix and a month later 2,000 mg. hrs. Growth on cervix cleared out in two months. She was given x-ray to tolerance and all palpable signs of the tumor have disappeared.

Case III. This was a growth the size of a hen's egg and formed a hard, resistant, indurated mass in the left pelvis. It was given 2500 mg. hrs. and one month later 2000 mg. hrs. Cervix became normal within two months. Treatment was supplemented by hard x-rays.

W. WARNER WATKINS, M. D.

Radium as an Adjunct to Surgery in Uterine Conditions. W. P. Fite, M. D., J. Oklahoma M. A., 16: 182, June 1923.

IN borderline and inoperable cases of uterine carcinoma, surgery is manifestly contra-indicated and radium the method to be employed. Wherever the involvement has extended beyond the cervix, the cases have, in the past two years, been treated exclusively by radium and x-ray, and the results certainly justify this course. With the involvement limited to the cervix, operation is still preferred; likewise, operation is preferred in cancer of the body of the uterus.

In fibroids in young women, radium is not used unless operation is contra-indicated or refused and the patient thoroughly understands the probable effect on the menstrual function. It should not be used after recent pelvic infections, in fibroids larger than a four months' pregnancy, in pedunculated growths, in cystic or myxomatous fibroids. Tumors diagnosed as fibroids but which continue to enlarge after treatment should be promptly operated.

W. WARNER WATKINS, M. D.

Fractures of the Scapula. Emile Bloch, M. D., New Orleans M. & S. J. 75:704, May 1923.

FRACTURES of the scapula are comparatively rare, among 2,358 cases at Hotel Dieu there were four. At the Charity Hospital from January 1906 to November 1922 there were recorded 8097 fractures, of which 28, or 2.89 per cent, were fractured scalpulae.

The majority of scapular fractures result from direct violence, with indirect violence and muscular action as rarer causes. All the series reported here were from direct violence.

In ten of these cases, the location of the fracture in the bone was not recorded. In six the fracture was in the body. In six the acromion process was fractured. In one the wing of the scapula was fractured. In one the scapular neck was fractured. The fracture extended into the glenoid in two cases. The coracoid process was fractured in two cases.

The author calls attention to the fact that the acromion process is completely ossified in the nineteenth year, contrary to the usual idea. Careful attention must be given to epiphyseal lines otherwise mistakes will occur in interpreting radiographs.

W. WARNER WATKINS, M. D.

Indications for Radium Treatment; Summary of Results. Lawrence A. Pomeroy, M.D., F.A.C.S., Ohio State M. J., 19:324, May, 1923.

THIS report is based on a series of 250 consecutive cases applying for radium treatment. The two important actions of radium on cancer are: (1) a direct destructive action on the cell nuclei; (2) an indirect action leading to the formation of fibrous tissue. There are two different methods of treating cancer with radium. One is to attempt the total destruction of all the cancer cells in one lethal dose; the other is to deliver the dose in fractional amounts attempting to destroy the cells when their nuclei are in process of division. As a rule the first method is used.

In 11 cases of lip cancer, 4 were not sufficiently treated, and 4 improved for a period of from one to eighteen months; 3 cases are apparently arrested after periods of from two months to two years.

Of 11 cancers of the tongue, 3 were not sufficiently treated, 3 were unimproved, 2 improved and 3 apparently were arrested.

Of 27 cases of malignant disease of the mouth, nose, pharynx and tonsil, 3 were not sufficiently treated, 7 were unimproved, 9 were improved and 8 remain apparently arrested.

Of 44 cases of cervical cancer, 2 were not sufficiently treated, 2 were not improved, 30 were improved, and 10 remain apparently arrested.

In 20 malignancies of the rectum and anus, 4 were not sufficiently treated, 2 were unimproved, 12 improved and 2 were apparently arrested. Preliminary colostomy should always be done before rectal malignancy is treated with radium.

W. WARNER WATKINS, M. D.

To Writers of Medical Papers. Editorial, Boston M. & S. J. 188: 1046, June 28, 1923.

"IT is a question whether writers of medical papers realize the responsibility that rests upon them when they quote the work of others * * *

"Recently attention has been drawn to the gross carelessness that exists among American writers in regard to exact quotations, proper spelling of authors' names and proper references in their bibliography.

"Probably in no single country does such a state exist to the same degree as it does here. A very few of the American medical publications verify such references and these are to be thanked for the hours of labor and careful search they have spared other investigators.

"In a recent extensive bulletin no less than eight references out of twenty-eight were wrong, two authors' names were spelled incorrectly and two articles were quoted that had no reference whatsoever to the text of the author's paper.

"* * * If criticism is to be avoided as to the author's faith and honesty, or unless writers wish to shake the faith of the reader in the reliability of the information presented, greater care must be shown in respect to the work of others.

"Let this matter be remedied now before we earn a name for which we shall have only ourselves to thank. Let the writer realize his responsibility and be fair, courteous and above all accurate."

Roentgenologic Diagnosis of Carcinoma of the Tail of the Pancreas. Thomas Scholz, M. D. and Felix Pfeiffer, M. D. J. A. M. A. 81: 275-277, July 28, 1923.

TWO cases are reported and the authors' conclusions from the study of these two are as follows: "In carcinoma of the tail of the pancreas, roentgen ray examination may furnish important diagnostic information. Roentgenologic examination reveals a permanent, irregular outline defect at the middle portion of the greater curvature of the stomach. Such an outline defect, although usually characteristic of, and interpreted as, neoplasm of the gastric wall, may some-

times be correctly recognized as being due to carcinoma of the tail of the pancreas, if the interpretation of the roentgen ray findings is guided by a full and proper consideration of the clinical aspect of the case. The main differential diagnostic feature in such instances is an obvious disharmony between the roentgenologic and the clinical manifestations, the latter showing a striking lack of direct gastric symptoms.

"Urgent call is made for a closer cooperation between clinician and roentgenologist, and an interpretation of roentgen ray findings along clinical lines—in short, for clinical roentgenology, because we sincerely believe that in clincal roentgenology lies the further development of radiodiagnostic possibilities."

The Roentgen Picture of the Bladder After Operation. Friedrich Kraft, M. D., Acta Radiologica 2:182-185, No. 6, May, 1923.

TYPICAL changes are encountered in the roentgen picture of the bladder after operation (with the exception of endovesicular methods).

A changed formation is often seen in the "fore-bladder" (better called the "after-bladder") after prostatectomy owing to the insufficiency of the internal sphincter muscle. An asymmetrical bladder shape often follows upon diverticulum operations. The changes consequent upon a suprapubic cystotomy are very difficult of roentgenologic demonstration. Incrustation of the sutures may lead one to a mistaken diagnosis of stones.

Complete Examination in Diseases of the Upper Right Quadrant. J. F. McCullough, M. D., and F. L. Schumacher, M. D. Pennsylvania J. Roentgenol. 4:1-8, July, 1923.

IN an examination of the upper right quadrant retroperitoneal pathology must first be eliminated by examination of the urinary tract, then a search for direct signs of cholecystitis must be made before examination by the opaque meal method.

Detailed directions are given for the roentgen examination for pyloric stenosis, pyloric spasm, gastric ulcer, gastric cancer, duodenal ulcer, and gall-bladder pathology.

The X-Ray Diagnosis of the Pathological Gall-Bladder. Abstract of an abstract of the Fourth Mackenzie Davidson Memorial Lecture, delivered by Dr. A. W. George, May 17, 1923. J. Roentgen Soc. 19:148-149, July 1923.

IN a large number of cases the shape, size and position of indefinite shadows on the x-ray plate are suggestive of gall stones. Often in such cases stones are not present but the shadow is due to a thickened gall bladder wall, inspissated bile or very thick, dark bile. This indirect evidence is very important.

A normal gall-bladder is not usually visible by x-rays nor does it cause pressure upon the gastro-intestinal tract rendered opaque by barium. A pressure deformity is nearly always due to a pathological gall-bladder. Such a deformity throws a half shadow, due to a concave or rounded surface pressing against a similar surface, the first part of the duodenum. If the edge of the liver presses against the duodenum the half-shadow is lacking —a fact which is of great importance in diagnosis. This pressure from a pathological gall-bladder is due to a tension within the gall-bladder greater than that within the barium filled duodenum. The lateral view is the position of choice.

The second part of the duodenum in normal individuals extends downwards parallel to the vertebrae and passes up behind the stomach as the third portion. In gall-bladder disease this second part is often directed out toward the liver and often outlines the size of the gall-bladder. The position is usually due to gall-bladder adhesions. Burnham of San Francisco is given credit for the observation that a duodenum passing backward toward the vertebrae and forming an angle passing down again to normal position is significant of gall-bladder pathology. Postoperative cases are most difficult to diagnose.

Pressure of the gall-bladder upon the antrum of the stomach frequently occurs as a pressure deformity in the first portion of the duodenum and in many cases the pressure involves both viscera at once. The half-shadow effect must be noted here.

The transposition of the jejunum from its normal position on the left side to the upper right quadrant frequently helps in diagnosis, however, this is at times due to peritonitis (especially if of a tuberculous nature) in early life.

In every case in the speaker's experience in which a series of gastro-intestinal films has shown the ampulla of Vater to be filled with barium, disease of either the gall-bladder or the pancreas has been found.

Often the only sign of a pathological gall-bladder is the "pseudo-hypatic flexure", a change in the position of the proximal end of the transverse colon somewhat like a secondary hepatic flexure.

With proper examination a diseased gall-bladder can in almost every instance be demonstrated on the plate. Even cholestrin stones, if present in large numbers, can be shown if only from the increased density and change in the shape of the gall-bladder. Therefore the negative findings have some value.

Carcinoma of the Small Bowel. Milton M. Portis, M. D., and Sidney A. Portis, M. D., Am. J. Roentgenol. 10:419-423, June, 1923.

CARCINOMA of the small bowel is exceedingly rare but is not difficult of diagnosis.

There are three distinct types found: (1)part of a local or general intestinal polyposis, more frequently found in the colon; (2) single or multiple benign embryonal carcinoid tumors found as opaque nodules the size of a pea or bean in the mucosa or submucosa of the ileum or jejenum; (3) localized adenocarcinoma which reaches a sufficient size when ulceration is delayed to obstruct the lumen, usually ulceration and stricture result.

Previous to obstruction symptoms may not be noticeable to the patient. Occult blood in the stool is one of the earliest symptoms. Asthenia and vague abdominal discomfort may be early symptoms. Pain is a later symptom and increases with obstruction. Constipation may be present or diarrhea or both alternately. Belching, nausea, anorexia, thirst and vomiting occur. With developing stenosis there will be tympanites, visible peristalsis and the tumor may be palpated.

The stomach may be ruled out by laboratory and x-ray examinations. A routine examination of all stools for occult blood will aid in early diagnosis when a cure may result, but if the case has reached the point where an operation for acute obstruction is necessary cure is then impossible.

Roentgen Gastro-Intestinal Studies of Patients with Deforming Arthritis. R. G. Taylor, M. D., Am. J. Roentgenol. 10:424-427, June, 1923.

THESE studies are based upon the theory of a gastro-intestinal origin of deforming arthritis.

Observations were made at 6, 9, 11, and 24 hours after ingestion of the meal. The majority of patients were found to have a certain type of colon characterized typically by its abnormal length and abnormal mobility. Second, practically all cases that have become chronic show so-called surgical lesions in the right colon, or in the ileum, or in both. Third, these lesions consist of adventitious bands similar to Jackson's membrane involving the colon, usually above the ileo-

cecal valve, and involving occasionally the ileum, producing the so-called Lane kink and other less typical fixations, or chronic appendicitis, or the results of an acute inflammatory process in the appendix with adhesions and fixation of the cecum and appendix to surrounding structures, notably the ileum and right colon itself (the appendix is frequently retrocecal), or if postoperative adhesions following removal of the appendix." These adhesions and bands result in a crippling of the intestines which will be evidenced as deformities in the barium shadow. Local stasis favors infection and perversion of the normal flora.

The demonstration of the lesions which are probably responsible for crippling and stasis is of chief interest to the radiologist. Some cases which show a crippled condition but no actual stasis offer a chance for purely medical treatment, the others are surgical. In the latter case the roentgenologist can assist the surgeon by ascertaining the type, location and kind of lesion to be expected. Nonsurgical cases have shown marked improvement and many of the surgical cases have shown complete arrest of the disease.

Some X-Ray Findings in the Lower Spine and Pelvis. S. A. Munford, M. D., and C. Harvey Jewett, M. D., Clifton Med. Bull. 9:58, No. 2, 1923.

THE authors emphasize the necessity of an x-ray examination of the lower spine and pelvis in patients complaining of pain in the lower back or leg. They give briefly the findings in sixteen cases. Three of these were metastases to the spine from primary carcinoma of the prostate, two more probably primary in this organ, while another had changes in the spine suggestive of primary prostatic carcinoma but was probably primary in the biliary system. Six cases were secondary to carcinoma of the breast. There was one case of an old fracture of the spine following injury seven years before, one case of ostitis deformans and one case of hypernephroma.

Their experience leads them to believe that structural changes in bones are rather frequent in people past middle life who complain of sciatica or pain in the spine, and that x-ray will often reveal changes even if a primary carcinoma is not evident.

—E. A. BAUMGARTEN, M. D.

The Lumbar Transverse Process. Morris I. Bierman, M. D., Am. J. Roentgenol. 10:456-458, June, 1923.

THE development of the lumbar vertebrae is traced through the embryonic to the adult stage.

The author's observations are as follows: "(1) The transverse processes of the lumbar vertebrae, especially the first lumbar, very frequently show anomalous development. (2) The unilateral lumbar rib is easily differentiated from fracture, unelss the rudimentary rib is very short. Then differentiation must be made by the appearance of the bone, the situation of the lesion, and the lack of injury to neighboring parts. (3) Unilateral or bilateral failure of the secondary epiphysis to unite with the transverse process, while probably the least frequent of the two conditions, will at times, also be difficult to differentiate if found after injury."

Roentgenograms of the Fetal Skeleton as a Positive Sign of Pregnancy. Irving F. Stein, M. D., and Robert A. Arens, M. D., J. A. M. A. 81:4-8, July 7, 1923.

UNTIL about a year ago the authors agreed with most other roentgenologists that fetal bones were hard to distinguish radiographically at any time before birth. However, during the last year, as a result of a systematic investigation of 400 cases they have changed their opinion. They have found it possible to demonstrate the whole fetus clearly, in some cases the hands and feet have been clearly shown, at six months but with painstaking technique they have been unable to demonstrate the fetus with regularity before five months and in only three cases out of 400 have they been able to demonstrate the fetus before quickening.

The interpretation of size and age from the shadow is very difficult. Fetal shadows may be very deceptive as to size, e. g., the appearance of a normal head may in the film suggest hydrocephalus, therefore caution in interpretation must be exercised.

Differential diagnosis between twins, monstrosity and hydramnios with a normal fetus can usually be made and almost invariably differential diagnosis can be made between pregnancy and fibroids, ovarian cyst, obesity, ascites, pseudocyesis and menopause. From six months to term the authors secure satisfactory results.

Differences in the Time of Development of Centers of Ossification in the Male and Female Skeleton. J. W. Pryor, M. D., Department Anatomy and Physiology, University of Kentucky Anatomical Record 25:267-275, June, 1923.

THE author says: "In the ossification of the human skeleton the female is in advance of the male from the earliest development of centers of ossification in the embryo and throughout intra-uterine life, progressing from days to weeks and months. After birth the differences are progressive up to the union of epiphyses with the shaft of the long bones, which takes place with the female from three to four years in advance of the male."

These conclusions were based upon a study of the roentgenograms of 140 fetuses (10½ weeks to 38 weeks, 71 male and 69 female) and 100 new born babies (few hours to ten days old, 48 male, 52 female).

Early centers could not be compared as but few fetuses were under twelve weeks, old. Principal points compared were: centers of ossification of the calcaneus, the talus, the cuboid in the tarsus, the epiphyses of the distal extremity of the femur, the central extremity of the tibia and centers of ossification of the capitatum and hamatum of the carpus.

The author believes that it may become possible to differentiate sex and make comparisons of the time appearance of centers of ossification several weeks before the external genetalia are characteristic.

Spondylitis Typhosa. S. N. Bakke, M. D., Acta Radiologica 2:176-181, No. 6, May, 1923.

THIS is a case report which was presented before the Norwegian Society for Medical Radiology. The Clinical picture corresponded to the cardinal symptoms as described by Quincke, namely, very intense diffuse local pains, an acute course, rapid abating of spinal pains, and noticeable swelling of the soft parts of the vertebral column.

The roentgenogram differs from that seen in spondylitis tuberculosa for there is no marked atrophy of lime and no destruction of the vertebral body. "Parallel with the pathological process present in the body of the vertebra there is a proliferating process going on, with a bridge-like connection between the second and third vertebra. The articular space between these two vertebrae is reduced. After fully three months a more transparent portion of the vertebrae was seen on the roentgenograms in profile, a sequestrum(?) being discernible in that point." There was no reaction to tuberculin injections.

A Lecture Delivered at the City of Dublin Skin and Cancer Hospital, on Deep X-Ray Therapy. Dr. Pilger, Erlangen Clinic. Arch. Radiol. & Electroth. 27:364-373, May, 1923.

IN Erlangen, whenever possible, concentrated tubes are used in preference to large cones of irradiation. The U. S. D. dose is defined as the erythema dose that produces a slight reddening within eight days after treatment and "a tender but well visible brown" four weeks after treatment. "This dose, as fixed by a certain number of minutes exposure with a certain apparatus running under certain conditions and a certain tube, was standardized as 100."

In treating uterine cancer six to seven fields are usually used, giving 18 per cent U. S. D. to each field. In thin patients five fields are usually enough. About one-half hour each is given and after six to seven weeks each parametrium is radiated. At the Frankfort clinic the first treatment is by the concentration method and the second by the distant field method.

Cancer of the breast is radiated from two fields, one in front and one behind, and in addition the supraclavicular and axillary glands are radiated. The distance and field size depend upon the location and size of the tumor. The dose is calculated at the lowest limit and therefore two radiations are usually given.

For good results in deep therapy it is absolutely necessary that the cancer tissue be replaced by healthy connective tissue which will give the cancer its final death blow. Therefore there must be adequate preparation of the patient so that the body force may be preserved. The biological effect of the rays, it is stated, is due to the scattered rays, therefore the formation of secondary rays in the body should be reduced as much as possible. Bowels and bladder should be empty, if barium is present it must be eliminated and there should be no metalic medicament present in the body. The compressing applicator is recommended in crossfire treatment because the anemia of the skin thus produced renders it much less susceptible to the rays, also the loose movable tissue of the bowels can be pushed aside.

Blood counts are taken before and after treatment. Providing the patient's general condition is good to start with, the count returns to normal in from three to four weeks. An *ungent leniens molle* is applied to the skin twice a day for several weeks. Rectal injections of pure olive oil are used in gynecological radiations. All patients treated at Erlangen are given printed instructions as to the avoidance of irritation. A subcutaneous injection of physiological NaCl solution is given after radiation and the patient is kept in bed for a period of several days to several weeks. A good light diet, preferably vegetables, is recommended. Intravenous injection of sterilized albuminous preparations is beneficial after treatment as is also treatment by iron and arsenic.

It is too early to say whether the new deep therapy will in time entirely replace surgery in cancer cases although the present results are "at least as good as surgery." The author says it must be remembered that "in compiling statistics the surgeon takes only operative cases into consideration and excludes inoperable ones whilst x-ray therapy statistics include a large number of inoperable cases in which x-ray treatment is the only possible one."

Sarcoma, lymphosarcoma, Hodgkin's disease, myoma and "climateric diseases", tuberculous glands, tuberculosis of the peritoneum and of the joints, and many skin diseases are named as lesions in the treatment of which the x-ray has proved itself of undoubted value.

The Present Status of Radiotherapy. H. W. Van Allen, M. D., Boston M. & S. J. 189:5-8, July 5, 1923.

ROENTGEN history is divided by this author into three periods—the optimistic, the pessimistic, the realistic. The latter in general characterizes the present time though illustrations of the pessimistic attitude are still to be found. Dr. Borden's article in the Boston M. & S. J. (abstracted in the J. Radiol. June, p. 212) is illustrative of the pessimistic attitude. Dr. Van Allen charges that the results in these cases were due to the fact that the Witherbee technique was not strictly adhered to as only half the number of required treatments were given, hence results could not be satisfactory.

Out of the writer's experience of twenty-five years in the practice of roentgen therapy and many years in the practice of radium therapy he relates success in the treatment of the following lesions: Epithelioma (radium), minor superficial lesions such as keratoses, warts (many so-called corns are warts), keloid, pustular acne (in this the real cause must be sought out and removed or cure will not be permanent), excessive local perspiration, some forms of eczema, psoriasis (believes results with this due to systemic result), and last among these, ringworm.

He reports prompt and satisfactory results in x-ray treatment of the thymus. Leonard of Boston is cited as being successful in x-ray treatment of whooping cough. Hyperthyroidism the writer believes should usually be treated by the x-ray rather than by surgery. In tonsillar cases he prefers radium to x-ray. Angioma, either deep or artificial has yielded good results in his practice. Success in deep therapy is recounted.

The Treatment of Active Infantile Tetany with Radiations from the Mercury Vapor Quartz Lamp. Horton Casparis, M. D., and Benj. Kramer, M. D. Bull. Johns Hopkins Hosp. 34:219-220, July, 1923.

FIVE cases of infantile tetany were treated. Clinical manifestations were unmistakable and three of the patients had convulsions before treatment. Symptoms disappeared after raying, and healing of the rachitic process occurred in every case. The calcium concentration of the serum was raised and also the inorganic phosphorus concentration of the serum was raised to the normal level or above.

A diet of milk and farina was adhered to throughout the treatment. The technique of treatments was as follows: Distance 18 inches, intensity 9 amperes. Time—*1st day*, 5 min. front, 5 min. back; *2nd day*, 10 min. front, 10 min. back; *3rd day*, 15 min. front; *4th day*, 15 min. back; *5th day*, 20 min. front; *6th day*, 20 min. back, and so on, alternating front back but at no time exceeding 20 minutes exposure. Clinical manifestations of tetany ceased in from three to seven days.

Some Details of Technique of Actinotherapy in Dermatology. Carroll S. Thomson, M. D., Am. J. Electroth. & Radiol. 41:215-217, July 1923.

IN his practice the author regulates treatment by the first, second, third or fourth degree erythema. First degree erythema gives scarcely a visible effect and is discernible only in a strong light. Second degree gives an effect similar to mild sunburn, third degree resembles a severer sunburn and produces exfoliation of the epidermis. Fourth degree erythema is a blistering erythema.

Each lamp is a rule to itself and every operator should first standardize his lamp on his own skin and, remembering that blondes respond more quickly than do brunettes, govern his technique accordingly.

In difficult dermatological conditions radiant light and heat are used in connection with actinic rays.